CEREAL SCIENCE today

NOVEMBER 1961 • VOL. 6 • NO. 9 • 60C

ASSOCIATION OF CEREAL CHEMISTS

MYVEROL®
DISTILLED MONOGLYCERIDES

come with different degrees of saturation for different jobs

Saturated distilled monoglycerides are best for starch complexing, foam stabilization, promoting fine grain in baked goods.

Unsaturated distilled monoglycerides are best for water-in-oil emulsifying, foam suppression, improving wetting properties of oils.

For each of the wide variety of jobs that distilled monoglycerides are performing in successful food products today, there is a best choice of ratio between saturated and unsaturated parent fats. We want to help you find it.

Here is a table of constants for some of the more widely used *Myverol* Distilled Monoglycerides with which we work in solving problems.

TYPICAL CHEMICAL AND PHYSICAL CONSTANTS OF *MYVEROL* DISTILLED MONOGLYCERIDES

MYVEROL TYPE	18-00 Fully Hydrogenated Lard	18-07 Fully Hydrogenated Cottonseed Oil	18-40 Prime Steam Lard	18-85 Refined Cottonseed Oil	18-98 Refined Safflower Oil
Monoester Content	← Minimum 90% →				
Saponification Value	← 155-165 →				
Iodine Value	1 max.	2 max.	50	85	115
Congeal Point	68°C. 154°F.	67°C. 153°F.	54°C. 129°F.	46°C. 115°F.	26°C. 79°F.
Clear Point	73°C. 163°F.	76°C. 169°F.	60°C. 140°F.	56°C. 133°F.	40°C. 104°F.
Typical Fatty Acid Composition of Parent Fats and Oils:					
% Saturated	100	100	40	26	8
% Unsaturated			60	74	92

For further discussion, write ***Distillation Products Industries,*** Rochester 3, N. Y. Sales offices: New York and Chicago • W. M. Gillies, Inc., West Coast • Charles Albert Smith Limited, Montreal and Toronto.

distillers of monoglycerides made from natural fats and oils

DPi

Also . . . vitamin A in bulk for foods and pharmaceuticals

Distillation Products Industries *is a division of* **Eastman Kodak Company**

with matchless uniformity!

It's HumKo Products' ability . . . and *proven record* . . . to produce *any* type, *any* amount of special formula shortening, right down to the "very letter" of your specifications. (Fact is, HumKo makes dozens of *different* kinds of shortenings *daily*.)

Skilled shortening specialists, modern manufacturing and research facilities, and helpful technical services make HumKo one of the nation's largest and most dependable suppliers. Find out how HumKo can provide the answer to *your* shortening problem.

HUMKO

PRODUCTS

MEMPHIS, TENNESSEE

General Offices and Main Plant — Memphis, Tennessee

Midwestern Plant — Champaign-Urbana, Illinois

PURPOSE

The American Association of Cereal Chemists is devoted to: 1) the encouragement of scientific and technical research on cereal grains and their products; 2) the study of development and standardization of analytical methods used in cereal chemistry; 3) the promotion of the spirit of scientific cooperation among all workers in the field of cereal chemistry; 4) the maintenance of high professional standards of its membership; and 5) the encouragement of a general recognition of the value of the chemist and biologist to the cereal industries.

EXECUTIVES

James W. Evans - - - - - - President
American Maize-Products Co., Roby, Ind.

Majel M. MacMasters - - - - President-Elect
Kansas State University, Manhattan

Byron S. Miller - - - - - Secretary
General Mills, Inc., Minneapolis

Marjorie A. Howe - - - - - - Treasurer
Russell Miller-King Midas Mfg. Co., Minneapolis

Raymond J. Tarleton - - Executive Secretary
1955 University Avenue, St. Paul

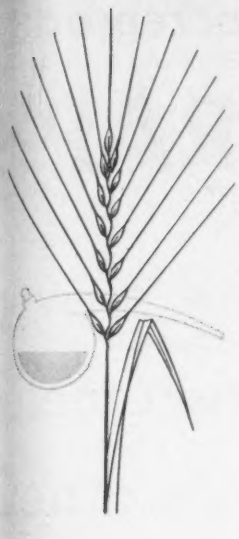
AMERICAN ASSOCIATION OF CEREAL CHEMISTS

DIRECTORS

The Board of Directors is composed of the four officers of the Association plus five directors as follows: John A. Johnson, Kansas State University, Manhattan; Glenn E. Findley, Burrus Mills, Dallas; Lawrence L. Warren, Commander Larabee Milling Co., Kansas City, Mo.; S. F. Brockington, Quaker Oats Co., Barrington, Ill.; Norman E. Lloyd, Clinton Corn Processing Co., Clinton, Iowa.

MEMBERSHIP

Membership in the AACC is open to professionally qualified individuals anywhere in the world. Corporate memberships are available for those companies wishing to lend industry support to the scientific work of the Association. An application form for membership may be obtained by writing the American Association of Cereal Chemists, 1955 University Avenue, St. Paul 4, Minnesota.



FEATURES

COVER: A sliding microtome being used to section a wheat grain for subsequent photomicrographic examination. Photo by Robert McGraw, General Mills Central Research Lab., Minneapolis, Minn.

CEREAL SCIENCE today

NOVEMBER 1961 VOLUME 6 NUMBER 9

DEPARTMENTS

CEREAL SCIENCE Today is published ten times per year (monthly except June and August) by the American Association of Cereal Chemists, from 500 South 5th Street, Minneapolis 15, Minnesota. Editorial, Circulation and Advertising Headquarters: 1955 University Avenue, St. Paul 4, Minnesota. Second class postage paid at Minneapolis, Minnesota.

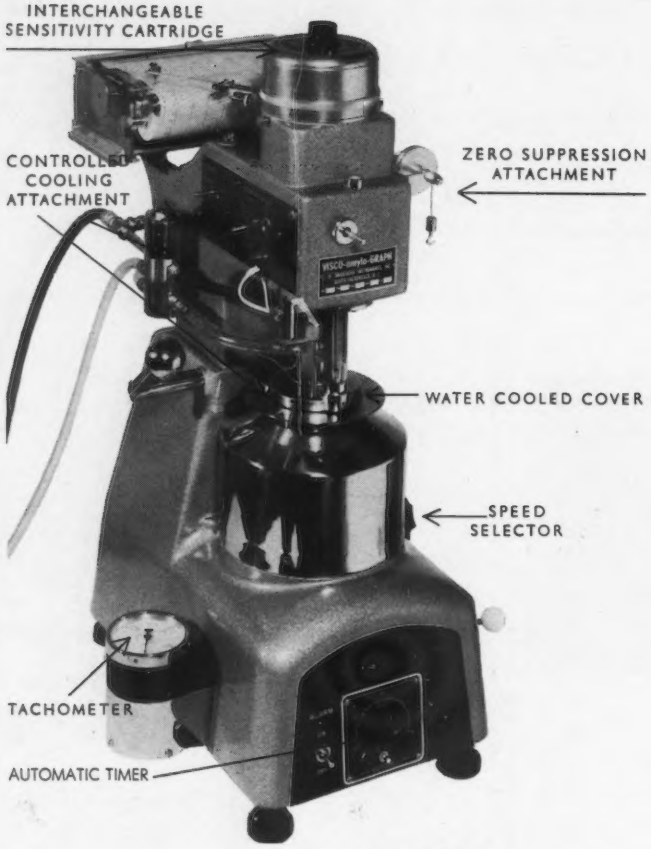
Subscription rates: 1 year, $5.00; 2 years, $8.00; 3 years, $11.00. Foreign postage: $1.00 per year extra. Back issues available on request. Single copies: 60 cents.

CHANGE OF ADDRESS: Notify Circulation Department, American Association of Cereal Chemists, 1955 University Avenue, St. Paul 4, Minn. Include both old and new addresses and postal zone number, if any. Claims for missing numbers will not be allowed if received more than 60 days from date of mailing plus time normally required for postal delivery of journal and claim. No claims allowed when subscriber has failed to notify the Circulation Department of a change of address, or because copy is "missing from files."

STAFF

Certified Calibration by C. W. of So. Hackensack

VISCO / amylo / GRAPH



...a time proven Viscometer with a new versatility

by C.W. Brabender

New VISCO/amylo/GRAPH with the same basic time proven design. Now, with 5 factory installed accessories of your selection, it can be "job rated" to suit your requirements.

CERTIFIED FLOUR • C.W.B. • STANDARD CALIBRATION

- Solenoid Controlled Cooling Attachment
- Zero Suppression Attachment
- Interchangeable Sensitivity Cartridges (standard amylograph sensitivity plus 3 others)
- Water Cooled Stainless Steel Sample Bowl Cover
- Stepless Variable Speed Control

Do you own an older instrument?

If so, C. W. Brabender offers **free calibration checking service.** We'll send you our calibration kit for checking your instrument's reading in relation to our starch and flour standard Visco/amylo/Graph in our Technical Service Laboratory.

Write or call C. W. BRABENDER, president, for free diagnostic service and modernization of old style models at nominal cost.

C.W. Brabender INSTRUMENTS, INC.

50 E. WESLEY STREET

SOUTH HACKENSACK,

NEW JERSEY **DIAMOND 3-8425**

editorial

Consistent and efficient decision-making can become almost automatic with the application of statistical methods to data analysis. When such apparently infallible tools are employed, it is important to remember that errors may still be made. Experiments may be poorly designed. Sampling may be inadequate. The method of statistical analysis may not be appropriate for the objective that is sought.

To facilitate meaningful communication within their ranks, statisticians have agreed on very exact definitions for certain terms. "Significant" means the betting odds are at least 19 to 1 against a chance occurrence of an observed difference. "Highly significant" describes odds of 99 to 1 or greater. There are times when it would be desirable to exchange some degree of certainty for an answer that can be obtained sooner and with less expense. This can be done.

In common with other scientists, statisticians are likely to work by setting up and testing hypotheses. Comparison of two treatments may be made by testing the hypothesis that they are actually identical. "Statistical proof" of such a hypothesis is subject to two types of error. Type I error occurs when a true hypothesis is rejected. Type II error is the result of accepting a false hypothesis. Usually the test hypothesis is set up on the assumption that a "sin of omission" is far less serious than a "sin of commission."

To realize full value from statistical aids to decision-making requires an understanding of the principles as well as the techniques, of the limitations as well as the capabilities, of these valuable tools.

P.E.R.

QUALITY IS a serious concern in the food industry, and the highly competitive character of the industry makes cost a serious concern also. We cannot divorce quality and cost. We pay for quality in many ways: in the materials used; in the selection of equipment and processes; and in the amount of quality control employed. The problem is to control that price. Many of the elements of cost of quality are not simple to control, but the cost of quality control laboratory manpower is one element that can be controlled.

measurement and control of workload in Q C Laboratory Operations

By John M. Dunkley
The Pillsbury Co., Springfield, Ill.

Control of manned operations starts with work measurement. This is true of manufacturing operations and it is also true of quality control operations. Work measurement is simply the measurement of the time it takes for a person to do a task. We can get some control of laboratory manpower costs by assigning tasks that will assure a full workload for employees. Quality control laboratory operations are well suited to this type of control because the operations are repetitive, they can be standardized, and they are essentially manual tasks.

Knowing the time required for various laboratory operations is the key to several possibilities; work assignments of laboratory operators can be made to assure a full workload; a performance measurement system can be set up to keep a continuing measure of the workload assignment; time value information establishes the method and procedure of a job and defines the demands of the job in such a way that it is useful in training operators; and problems of peak workloads and queuing of samples can be examined more accurately when time values are available.

Work Measurement

Measurements were taken of the tasks performed by operators in the mill control laboratory and the mix control laboratory. Industrial engineers were assigned to this typical work measurement job. Industrial engineers have devoted a good deal of time to developing workable techniques for measuring jobs. Work measurement need not be a complicated affair. It can be done satisfactorily by nonspecialists; but an understanding of the general approach is important.

The measurement technique was motion and time study. There is nothing new or unusual about this technique, but there is significance in the use of the term "motion and time study" rather than time study alone. Work cannot be measured satisfactorily by time study alone. Methods are really the determining factor in the time it takes to complete a task.

The time to do a given task is a function of the motions used and the speed of those motions. Speed is largely a personal matter with the operator and is concerned with his effort, or will to work, and the skill that he has. The motions used are a function of the equipment and tools the operator uses and their relationship to each other. Control of time to do a particular task begins with establishing the best arrangement of tools, equipment, and operating procedure. The first step, then, is to examine the layout and methods used in performing various tasks.

This is not the place for a detailed description of the techniques of motion and time study. There are good references available for complete explanation of the methods (1,2). Standard methods and standard times were established for all of the detailed tasks performed in the mill control laboratory and the mix control laboratory (Tables I and II). The times recorded tell the number of minutes that it should take an operator to perform these tests under existing conditions of layout, equipment, and method. These are not universal time values that could be expected to apply under all circumstances in all laboratories.

Two characteristics of these operations complicate the development of a standard time: 1) most of the test procedures require a long time cycle and 2) the tests are normally performed with groups of samples so that elements in the test cycle are performed on several samples at a time. This makes it necessary to assemble the time value for one test out of observations of this test being performed on a group of samples. It also makes it

Table I. Summary of Test Times in Mill Control Laboratory

Test	*minutes/sample*
Moisture	2.2
Ash	3.4
Diastatic activity	4.9
Enrichment	8.3
Protein	2.8
Viscosity	5.2
Bromate	1.0
pH	2.2
Fisher	3.2
Fat extraction	6.9

Table II. Summary of Test Times in Mix Control Laboratory

Test	*minutes/sample*
Brownie	5.8
Hot roll	8.9
Layer cake	6.3
Pie crust	4.1
Pancake	4.6
Farina	1.3
Sno-Sheen	1.3
Date bread	5.2

more difficult to get a reliable result because of the time required to make all of the necessary observations. These obstacles are troublesome but not insurmountable.

Development of Control

Two objectives were kept in mind in acquiring these data. The workload of operators was checked to see if the laboratories were properly staffed. The operators were told how the job should be done and how long it should take them, so that they could have a measure of their own effectiveness.

The workload of individual operators can be calculated if the time required for a test and its frequency are known. Information on the frequency of performance of the various tests was assembled. This was done on a historical basis for the mill control laboratory. It was necessary because the same tests are not performed on all samples. The results were examined and frequencies of the various tests were determined. The workloads were summarized from this information (Table III). This workload summary tells 1) how many minutes the operators should be occupied, 2) whether or not the staff is the proper size, and 3) whether or not there is capacity for other work in the laboratory.

The development of workload information in the baking mix laboratory was less difficult. The same series of tests are run on all samples or on particular samples at given intervals. This made the frequency of performance of the various tests predictable. The computation of the workload was performed in the same way as in Mill Control.

Table III. Summary of Testing Time Required for Mill Control Tests

Test	minutes/ sample	samples/ shift	minutes/ shift
Moisture	2.2	78	171.6
Ash	3.4	60	204.0
Diastatic activity	4.9	3	14.7
Enrichment	8.3	9	74.7
Protein	2.8	85	238.0
Viscosity	5.2	7	36.4
Bromate	1.0	5	5.0
pH	2.2	15	33.0
Fisher	3.2	7	22.4
Fat extraction	6.9	2	13.8
Total			813.6

Resume

Examination of this workload has been satisfactory. An additional possibility is open in the future if it seems worthwhile. The daily workload can be calculated by reporting the number of times particular tests are performed and applying a standard time to these units. This provides a daily performance measure to tell the workload of the operators.

Standard time information is of value in training laboratory workers. To a large degree the problem in getting a worker to perform is in giving him an understanding of what is expected. The standard time is a positive goal for the worker. A description of the method employed in developing this standard time is also a very positive guide to the worker in developing the correct method, and consequently being able to achieve the proper time. These standard time values are used with laboratory operators to help them understand what is expected of them.

Another possibility for use of these data is in analysis of peak loads on the laboratory. It is not necessarily economical to staff operations to meet peak conditions of demand for test results; this entails a certain amount of queuing of samples at the control laboratory and a resultant lag in results for control of production. The economics of such situations can be resolved with the help of standard time records and good information about the possible costs arising from delay in test results.

Work measurement in quality control laboratory operations is possible and practical. It is essential to good management. Control of costs and protection of quality are not necessarily incompatible objectives. This kind of a program can be carried out on a scale appropriate to the savings that can be made. The least that can result from such a program is an improvement in the amount of quality protection that can be provided for the price.

Literature Cited

1. BARNES, R. M. Motion and time study. Wiley: New York (1951).
2. MUNDEL, M. E. Motion and time study. Prentice-Hall: New York (1960).

INVITATION FOR PAPERS TO BE PRESENTED AT THE 47th ANNUAL MEETING, ST. LOUIS, MAY 20-24, 1962

Members of the AACC are invited to present original scientific papers at the 47th Annual Meeting. The broad scope of the program is now firming up, and you should contact any of the Session Chairmen listed below if you think that you will have a paper to present.

Fats and Oils: Mr. John B. Woerfel, Armour & Co., Box 9222, Chicago 90, Ill.

Feed: Mr. Waldon H. Hastings, Dept. of Flour and Feed Milling Ind., Kansas State Univ., Manhattan; Dr. H. C. Schaefer, Ralston-Purina Co., 835 S. 8th St., St. Louis 2, Mo.

Flour: Miss Doris Baker, USDA, AMS, Agr. Research Center, Beltsville, Md.

Food Additives: Dr. Virdell E. Munsey, Food & Drug Admin., 12th and C Sts. SW, Washington 25, D.C.

Milk Powder and Proteins: Mr. Charles A. Becker, Sheffield Chemical Co., Norwich, N.Y.

Practical Lab Techniques: Mr. Robert B. Kilborn, The Wheatena Corp., Highspire, Pa.

Pre-Milling Treatment of Wheat: Mr. Paul J. Mattern, Dept. of Agronomy, Coll. of Agr., Lincoln 3, Nebr.

Applications and Properties of Soybean Products: Mr. Dale W. Johnson, 1825 N. Laramie Ave., Chicago 39, Ill.

Starch: Dr. Thomas J. Schoch, Corn Products Co., Box 345, Argo, Ill.

Wheat Proteins: Dr. Walter Bushuk, 190 Grain Exchange Bldg., Winnipeg 2, Manitoba

Yeast and Baking: Dr. R. D. Seeley, Anheuser-Busch, Inc., 721 Pestalozzi St., St. Louis 18, Mo.

KENTON L. HARRIS
General Chairman, Program Committee

a review of available data and recent investigative techniques on

The Phospholipids of Wheat Flour[1]

By D. F. Houston

Western Regional Research Laboratory[2]
Albany, California

CEREAL CHEMISTS ARE well aware of the importance of flour lipids in baking and in flour quality. They are probably equally well aware of the confusion of information that has become embedded in the literature over a long period of years. This has been emphasized in recent reviews by Cookson and Coppock (8), by Glass (13), and by Mecham and Pence (17). All point out that more accurate specific knowledge of the individual components of the lipid mixture is needed for an understanding of flour behavior.

Many also realize that in the past decade development of this knowledge has become more feasible and is gradually being obtained through powerful, newly available techniques. The process is not yet easy, however, for this complex array of compounds is sensitive, often both to oxidation and hydrolysis. Much current information on lipids is presented in Hanahan's book, *Lipide Chemistry* (14).

Lipid Compounds

What types of lipid compounds may be present in solvent extracts of wheat flour? We have:

1. *Simple lipids.* These are chiefly the triglycerides found in the usual cooking oils, but may also include mono- and diglycerides.

2. *Compound lipids.* These are usually more complex, such as the phospholipids which have phosphorus and nitrogen in the molecule. Glycolipids contain carbohydrate moieties instead of, or in addition to, the above groups. Sphingolipids are based on a long-chain amino alcohol instead of glycerol.

3. *Derived lipids.* These consist chiefly of free fatty acids, though mono- and diglycerides, lysophosphatides, and phosphatidic acids might be included here.

4. *Associated compounds.* In crude extracted lipids there may be pigments, sterols, tocopherols, and such unexpected compounds as free sugars and amino acids. Even urea and alkali halides have been reported present, as the result of strong intersolubility effects, in lipids from sources other than wheat flour.

Of this array of compounds we will presently consider only the flour phospholipids — or more accurately the compound lipids, for glycolipids are also important constituents in the mixture from wheat flour. Nelson, Glass, and Geddes (18) have recently examined carefully the simple lipids.

It must also be remembered that total flour lipids include some compounds from bran and germ, for it has been found (19) that some 25 to 30% of flour lipids arise from kernel components other than the endosperm.

An additional reason for studying the compound lipids is that, according to recent findings by Cole, Mecham, and Pence (7), this part exerts distinct effects on the cookie-baking characteristics of flours.

Lipid Extraction

Extraction of phospholipids requires polar solvents such as 2:1 chloroform-methanol or water-saturated butyl alcohol (16), and the extracted mixture is frequently washed or passed through cellulose columns to remove extraneous water-soluble compounds. There is a possibility in both steps of forming artifacts through hydrolysis or oxidation.

Simple lipids are effectively separated from compound lipids by elution with chloroform on a silicic acid column (3), and the compound lipids may be removed with methanol. Such separations are frequently more useful than those by acetone insolubility. Lipid fractionations on silicic columns have recently been reviewed by Wren (23).

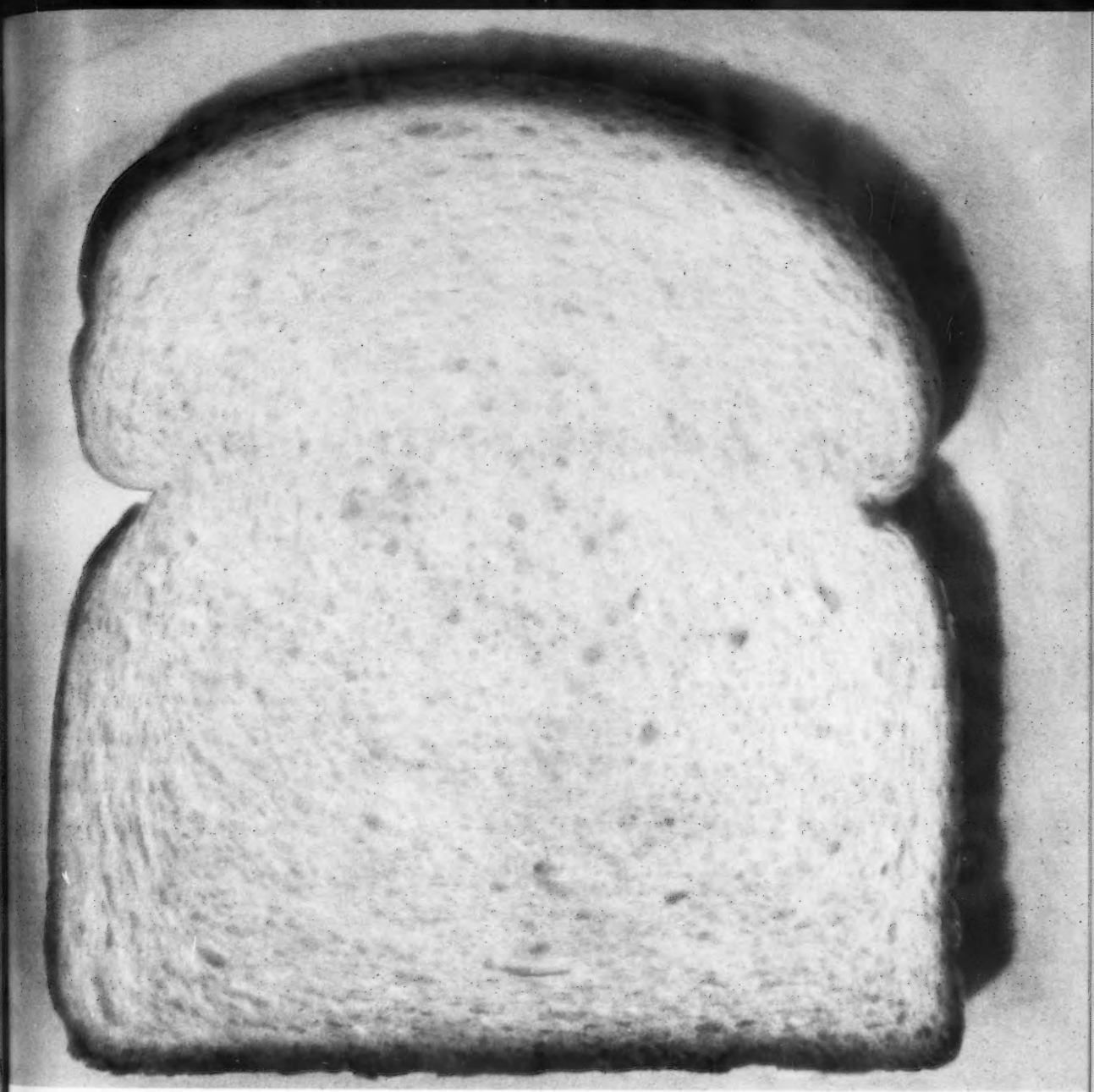
Segregation of compound lipids into classes (at times to single components) is often done by countercurrent extraction (15) or by chromatography on silicic columns (9,10). The column processes appear less affected by intersolubility and concentration changes than the countercurrent method. The fractions obtained are subjected to further separation procedures, or components present are determined by various analytical methods.

And what has been found by investigations to date? The mixture has been partially disentangled, though many questions are still unanswered.

Important constituents are the ubiquitous phospholipids, lecithin and cephalin (Fig. 1), now more accurately named phosphatidyl choline and phosphatidyl ethanolamine and serine. Lysophosphatidyl choline and ethanolamine (having only one fatty ester group) were also reported from Ponca and Red Chief flours by Mason and Johnston (15) in an elegant examination of acetone-insoluble flour lipids by 800-tube countercurrent extractions.

[1] Presented at the 46th annual meeting, Dallas, Texas, April 1961.

[2] A Laboratory of the Western Utilization Research and Development Division, Agricultural Research Service, U. S. Deparmtent of Agriculture.



Full flavor and appetizing aroma are two big advantages of the superior fermentation resulting from...

CERELOSE®
dextrose sugar

WRITE OR PHONE

Corn Products for expert technical assistance...helpful data on these fine products for Bakers:

CERELOSE® dextrose sugar • REX® • GLOBE® and MOR-SWEET® corn syrups • BUFFALO® starches.

CORN PRODUCTS COMPANY INDUSTRIAL DIVISION • 10 East 56 Street, New York 22, N. Y.

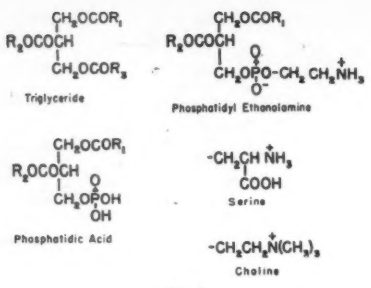


Fig. 1

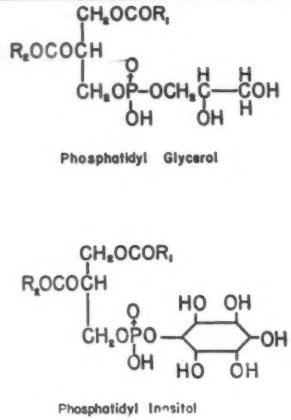


Fig. 2

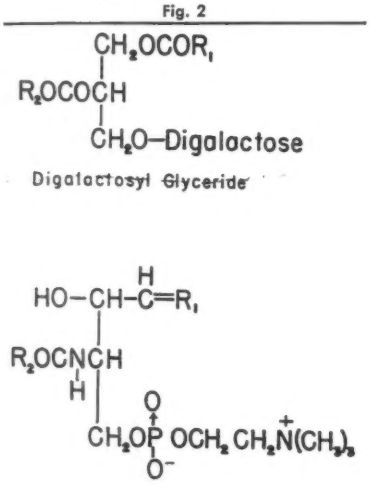


Fig. 3

Figs. 1, 2, and 3. Some lipid types.

If the phosphoric group is not substituted we have phosphatidic acid. Large amounts were reported by Barton-Wright (1) in flour lipids, but Mason and Johnston concluded that less than 10% could be present in their material. These are controversial compounds, often arising as artifacts, and their primary occurrence is the subject of active debate. More evidence is needed on their presence in wheat lipids.

Some phospholipids have nonnitrogenous groups attached to the phosphoric portion (Fig. 2). Phosphatidyl glycerol and related compounds have been found by Benson and co-workers (2) in plant materials and may well be present in flour.

Phosphatidyl inositol was isolated from wheat germ by Fauré and Morelec-Coulon (11), and was reported present in flour lipids by Coppock and co-workers (9) in countercurrent extraction experiments. The phosphatidyl inositols from other sources have contained chiefly saturated acids rather than the usual high proportion of unsaturated acids in compound lipids. This could also be true in flour lipids.

Another important constituent (Fig. 3) was isolated from lipids of bleached flour by Carter and co-workers (6). This is digalactosyl (and monogalactosyl) glyceride. Carter actually isolated the galactosyl glycerols from which the fatty acids had been hydrolyzed. These acids contained appreciable percentages of chlorine. The original acids in these compounds have not been investigated.[3] Mason and Johnston (15) found almost exclusively the digalactosyl compound, and calculated it to form as much as 40% of the compound lipids. The structure of these compounds suggests possible bread-softening effects.

Wintermans (20) has recently pointed out that over 50 years ago (1908 and 1909) Winterstein and co-workers (21,22) found important amounts of reducing sugars, including galatose, in hydrolysates of lipids from plant sources. Galactolipids were very likely involved; the highest percentage of sugar occurred in wheat flour lipids.

A phospholipid of rather different structure, sphingomyelin (Fig. 3) or a related compound, also apparently occurs in small amounts. It is based on an amino alcohol containing a long hydrocarbon chain (including R_1 of the figure) instead of glycerol, carries a single fatty acid, and has two nitrogens for each phosphorus. Results of Mason and Johnston suggest that two different types of these long-chain base materials occurred in small amounts in their flour lipids.

Very recently Carter and co-workers (4) have isolated a mixture of cerebrosides from flour lipids, and separated four components from it. Cerebrosides are long-chain base compounds like sphingomyelin but contain no phosphorus group; the sugar is linked directly to the long chain. One of the cerebrosides isolated had previously only been found in animal lipids.

A galactose-containing lipid of much more complicated structure (Fig. 4) was found in the germ

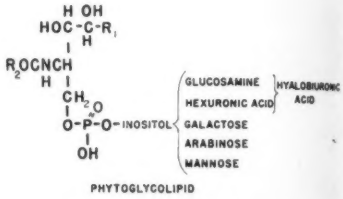


Fig. 4. Phytoglycolipid formula.

lipids by Carter (5) and may be present in flour lipids. The structure has been only partially determined.

New Separations

The complex mixture of these compounds has been receiving increased attention now that separations are possible which will allow more accurate comparisons and evaluations. Besides the recently reported work of Mason and Johnston (15), Daniels (10), Nelson, Glass, and Geddes (18), and Cole, Mecham, and Pence (7), investigations are in progress at our Laboratory, by Fisher and associates at the British Baking Industries Research Association (12), by Wren at Lyons Laboratories in London (24), by Carter *et al.* at University of Illinois (4), and likely at other research centers.

Some preliminary examples may be presented from our work to show the types of separation that are obtained. Comparisons are being made of the lipids from high- and low-protein fractions (22.4 and 4.5%, dry basis) from fine-grinding and air-classification of a straight-grade flour commercially milled from soft white wheat. Comparisons are also in progress of lipids from the gluten and original straight-grade flour commercially milled from a hard red spring

[3] Author's note added in proof: Analyses of the fatty acids of the galactosyl glycerols have appeared since this survey was written: Carter, H. E., Ohno, K., Nojima, S., Tipton, C. L., and Stanacev, N. Z. *J. Lipid Research 2:* 215-222 (1961).

Table I. Lipids of Air-Classified Flours

Flour	Total Lipid: Dry Flour	Total Lipid: Protein	Lipid Characteristics: N	Lipid Characteristics: P	Lipid Characteristics: N/P
	%	%	%	%	
Low-protein	1.44	32.0	0.81	0.80	2.24
Total flour	1.84	24.2	0.63	0.58	2.39
High-protein	4.43	19.8	0.62	0.70	1.98

Table II. Lipids of Commercial HRS Straight Flour and Gluten

	Total Lipid: Dry Flour	Total Lipid: Protein	Lipid Characteristics: N	Lipid Characteristics: P	Lipid Characteristics: N/P
	%	%	%	%	
Flour	1.68	10.8	0.69	0.57	2.67
Gluten	1.37	8.9[a]	0.59	0.67	1.96

[a]Percent of dry gluten.

wheat. All were unbleached.

The total lipid content is seen (Table I) to increase with protein content of air-classified flour, but at a lesser rate than the protein. The N/P ratio decreases. A similar change is evident (Table II) from flour to gluten. Some 82% of the flour lipid appears in the gluten to give 8.9% of its dry weight.

Separations of total lipids on silicic columns provided some 55 to 60% of the total (Tables III and IV) as compound lipids. The simple lipids contained little nitrogen or phosphorus and the compound lipids were enriched accordingly. In these examples the high N/P ratios may reflect the absence of washing to remove extraneous compounds. Also the low phosphorus content indicates the presence of nonphosphoric compounds, such as glycolipids, for phospholipids contain about 4% phosphorus.

Segregation of compound lipids of hard red spring wheat flour (Fig. 5) into classes on silicic columns by elution with chloroform-methanol mixtures yielded seven main groupings (peaks) based on phosphorus content. These were combined to form six classes of product. The weight distribution differed considerably: class 2 of the figure formed 60% of total weight and contained 0.85% phosphorus; class 6 had 11% of total weight and contained 5.6% phosphorus. Material with about 10:1 N/P ratio was concentrated in class

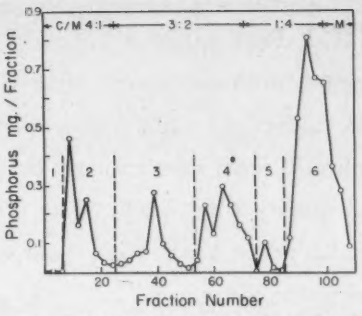


Fig. 5. Results of segregating compound lipids of hard red spring wheat flour on a silicic column.

3, which apparently contained lipoprotein; after hydrolysis, at least nine amino acids were detectable.

In comparison, the compound lipids from gluten showed a smaller weight percentage in the first peak, and more in the second. The sizes of the last two peaks based on phosphorus were reversed from the present run. Total sugar content in the gluten lipids was also lower than in flour lipids.

Corresponding segregations of compound lipids from high- and low-protein flour fractions were made under strictly comparable conditions. The plotted phosphorus distributions (Fig. 6) have been adjusted to an equal protein basis. The final large peak in each case is only indicated. Again the third peaks show high N/P ratios — about 3 to 5 — and lipoprotein appears present.

Phosphatidyl ethanolamine and

Table III. Lipid Distribution in Air-Classified Flour Fractions

Fraction	Lipid Distribution: Total Lipid	Lipid Distribution: Protein	Lipid Characteristics: N	Lipid Characteristics: P	Lipid Characteristics: N/P
	%	%	%	%	
Simple lipids					
Low-protein	37.1	11.9	0.03	0.03	...
Total flour	44.4	10.7	0.01	0.01	...
High-protein	40.0	7.9	0.01	0.01	...
Compound lipids					
Low-protein	62.9	20.1	1.04	1.32	1.74
Total flour	55.6	13.5	0.81	0.97	1.85
High-protein	60.0	11.9	0.79	1.17	1.49

Table IV. Lipid Distribution in Commercial HRS Straight Flour and Its Gluten

	Lipid Distribution: Total Lipid	Lipid Distribution: Protein	Lipid Characteristics: N	Lipid Characteristics: P	Lipid Characteristics: N/P
	%	%	%	%	
Simple lipids					
Flour	42.9	4.6	0.01	<0.01	...
Gluten	46.0	4.1	0.02	0.003	...
Compound lipids					
Flour	57.1	6.2	0.97	0.99	2.16
Gluten	54.0	4.8	0.92	1.16	1.76

serine occur mostly in peaks 2 and 3, though some of the serine compound in the salt form may be in later peaks. Phosphatidyl choline and its lyso derivative occur in final peaks, which may also contain any sphingomyelin-type material. Galactolipids are chiefly in peaks 1 to 3. The yet unidentified part

(Please turn to page 300)

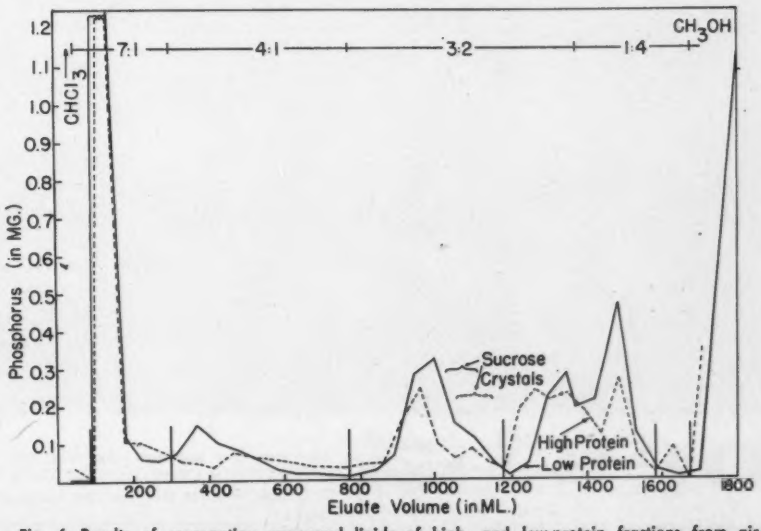


Fig. 6. Results of segregating compound lipids of high- and low-protein fractions from air-classification of a commercial soft-wheat flour on a silicic column.

THE MAGIC TOUCH OF LACTOSE makes food flavors sparkle with life!

Food products... whether bulk or packaged... take on bonus flavor with Lactose. This low sweet, sustained energy sugar of milk also extends shelf life, preserves aromas and boosts nutritional values. Only Western Condensing Company produces Edible Lactose in the full range of controlled mesh sizes required by the food field. Strict chemical and bacteriological specifications, rigid quality control and years of processing experience assure highest quality. For complete details, get in touch with Western, world's largest producer of Lactose, pure milk sugar. Write, wire or phone today.

Western Condensing Company • Appleton, Wisconsin

Division of Foremost Dairies, Inc.

Foremost lactose

new!

Fact-filled folder about Lactose and its many valuable uses.

Send for yours ***TODAY!***

WESTERN CONDENSING COMPANY • Appleton, Wis. 3K

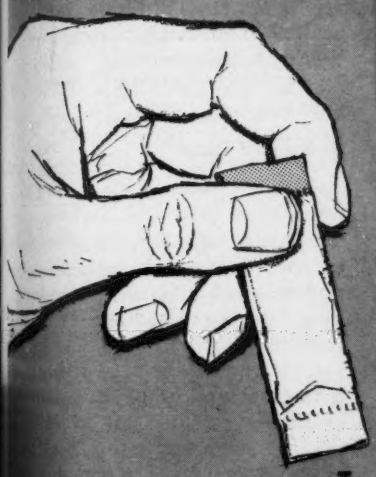
Please send me free Lactose Technical Bulletin L-1

Name_____

Company_____ Title_____

Address_____

City_____ Zone____ State_____

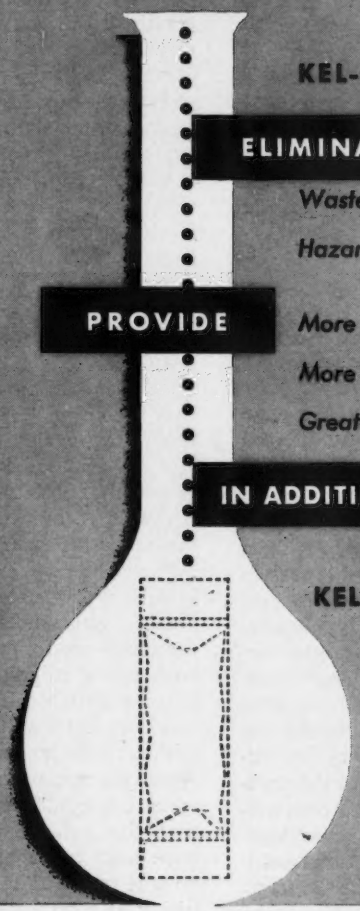


FOR YOUR CONVENIENCE

Harshaw KEL-PAK Digestion Catalyst Powders

Harshaw KEL-PAK Powders are carefully compounded mixtures of Potassium Sulphate; Mercuric Oxide and/or Copper Sulphate in sealed polyethylene packets containing sufficient catalyst for one protein determination.

To use, simply drop one packet into flask



KEL-PAK POWDERS

ELIMINATE

Messy mixing operations

Waste due to spillage and spoilage

Hazardous handling of mercury or its compounds

PROVIDE

More uniform mixtures

More accurate additions

Greater speed in adding catalyst to flask

IN ADDITION..

Polyethylene packet reduces foaming

KEL-PAK POWDERS are available in 5 formulas

#1 9.9 grams K_2SO_4; .41 gram H_gO; .08 $CuSO_4$
#2 10 grams K_2SO_4; .3 gram $CuSO_4$*
#3 9 grams K_2SO_4; .35 gram H_gO*
#4 10 grams K_2SO_4; .7 gram H_gO*
#5 15 grams K_2SO_4; .7 gram H_gO*
* Meet A.O.A.C. specifications

Write for more information and prices today.

HARSHAW SCIENTIFIC
DIVISION OF THE HARSHAW CHEMICAL CO.
1945 East 97th Street • Cleveland 6, Ohio

Sales Branches and Warehouses

Cleveland 6, Ohio, 1945 East 97th St.
Cincinnati 13, Ohio, 6265 Wiehe Road
Detroit 28, Mich., 9240 Hubbell Ave.
Houston 11, Texas, 6622 Supply Row
Los Angeles 22, Calif., 3237 S. Garfield Ave.
Philadelphia 48, Pa., Jackson & Swanson Sts.

Sales Offices: Baton Rouge, La.• Buffalo 2, N.Y.• Pittsburgh 22, Pa.• Oakland 11, Calif. Hastings-on-Hudson 6, N.Y.

weight-loss studies
and gas chromatography
define maximum limits of

The Migratory Potential of Volatile Packaging Components

By Kenneth Morgareidge and Robert D. Kross

Food and Drug Research Laboratories, Inc.
Maspeth, New York

THE ENACTMENT, IN 1958, of the Food Additives Amendment (Section 409 of the Food, Drug, and Cosmetic Act) has led to the re-examination of a number of old problems with which the food-packaging industry has dealt for many years. Substances which may migrate from packaging materials and thus become components of foods are classed as indirect food additives, and literally hundreds of such substances are now under active study. Nearly half of all the petitions filed to date under the provisions of the Act involve packaging components.

Whereas the majority of substances which may become indirect food additives do so as a result of direct physical transfer through contact, abrasion, or leaching of packaging components to foods, transfer via the vapor phase is also a possibility under certain conditions. The capacity of certain foods to pick up foreign odors or flavors, long recognized even by the housewife, has occasionally given rise to difficulties directly traceable to packaging components. Despite the exercise of care by the vast majority of food packers in the selection of suitable materials, the persistent, though sporadic, recurrence of consumer complaints indicates that all the problems have not yet been solved. In fairness, it should be said that the specific cases which have come to our attention have, almost without exception, been due to lack of adequate precaution and awareness in the selection of packaging materials and components. This is particularly true where the trouble has been clearly associated with the migration of a volatile substance which affected the taste or odor of food.

In presenting a current evaluation of the food additive status of volatile packaging components, several somewhat obvious factors should be mentioned first. Among these is the quantitative aspect. Practical functional limitations dictate that useful packaging materials contain only small amounts of volatile substances, since the loss of these on storage would often impair the essential utility of the package. Thus, even for nonodorous substances, the likelihood of massive contamination is almost nonexistent. The possibilities for contamination by substances possessing recognizable odor or taste characteristics are severely self-limiting. Any material with a definitely detectable odor would be expected to arouse the suspicions of the food packer and lead to an investigation of its suitability. But, if the level of volatile odorous substance is so low as to escape detection even on casual inspection, its potential migration to food sealed in packages might be so small as to be missed.

Safeguard Odor

Just how important a safeguard odor alone may be is apparent when one considers the sensitivity of the normal olfactory response and notes that it compares favorably with the most sensitive instrumental methods of chemical analysis. Organoleptic recognition of substances of low to moderate intensity is common at levels of a few p.p.m. in air or in bland carriers. Detection of more pungent or intense stimulants, under proper conditions, is routinely possible at concentrations in the range of 1×10^{-9} to 1×10^{-12} mol. %. Very few of even the more esoteric of modern instrumental methods approach or exceed this degree of sensitivity.

Such considerations lead to the conclusion that the rejection of foods by the consumer is most likely to occur at levels of noncharacteristic or objectionable flavors and odors where the actual amount of substance responsible for the rejection is extremely small. Obviously, these concentrations will also vary widely depending on the nature of the migratory substance and on the food involved, as well as on the physical design of the package. A number of these factors merit brief examination.

Since the scope of this discussion is limited to problems arising from volatile substances in packaging materials, we are mainly concerned with vapor migration via the air spaces within a container, although this does not mean that substances with relatively high vapor pressures can not migrate by physical contact as well. Neither does it mean that the volatile substance must have been incorporated in a component confined to the interior or lining of a package, since the materials of which these linings are composed often possess only limited vapor-barrier properties. Thus volatile substances in or on the outer surfaces of packages may, in some instances, penetrate into the food.

Another factor of significance concerns the relative affinity of the

food for the migratory vapor. Since we may consider that we are dealing mostly with closed systems, a high degree of absorbability of the vapor molecules in the food or of solubility in either the aqueous or fatty phase of the food will prevent the air spaces within the package from becoming saturated or from attaining equilibrium, and thus will favor absorption. It will be observed that most of the volatile substances likely to be encountered in the present context are organic molecules of relatively low molecular weight. They arise chiefly from solvent residues employed in the application of coatings, adhesives, and printing inks, although they may also be inherent in the formulations of paper products, elastomers, and plastics. Fats and foods of high fat content tend to absorb such substances more avidly than do strictly aqueous foods or those of low fat content.

Nothing which has been said above should be construed as argument that volatile packaging components of the general class described are necessarily food additives in the legal sense. In most cases, the compounds are well recognized as safe, under the conditions of use, and hence do not warrant classification as food additives. Nevertheless, both the packaging industry and the food packer should be as keenly aware of the public-relations aspects of even safe migrants which affect normal taste and odor of foods as they obviously are of other migrants which are now subject to food-additive regulation.

Case Studies

The consumer hears much discussion regarding chemicals in foods, and when she encounters a product which her own senses tell her is not right, her automatic reaction is to regard it and its maker with suspicion, if, indeed, she does not immediately call a lawyer. It may be illuminating to mention two actual instances which have been handled in our Laboratories recently. The first involved a large production of butter-type cookies made up on special order by a reputable bakery. There was nothing unusual about the recipe, which was a standard 17%-shortening formulation, to be furnished in both vanilla and chocolate flavors. The customer, however, requested a special design to be printed on the cover of the two-piece, coated chipboard carton. The bakery transmitted the order for cartons to its supplier of long standing, who had difficulty in correctly matching the color specified for the cover design, from ink stocks on hand. The local representative of an ink manufacturer was called and asked to supply ink of the proper color in the grade regularly purchased by the carton company. But time was short and the order was contingent on prompt delivery. Eventually, the cartons were made and delivered to the baker, who filled them and shipped his order of cookies. Within a week, trouble broke out and in a short time, most of the cookies were back on the baker's loading platform. They "tasted terrible." Cutting the story short, careful and painstaking investigation established that the special ink, which was applied to 75% of the surface of the carton, contained volatile substances which had penetrated the unlined chipboard and were absorbed by the fat-rich cookies, which were eventually converted to pig feed. The three-cornered litigation that developed was a source of satisfaction only to the lawyers.

The second case involved a manufacturer of a popular chocolate-coated candy in the moderate price range, which enjoys wide distribution through the large supermarket chains. When an alarming number of field complaints and merchandise returns began to accumulate, investigation brought out the following circumstances. The special feature of the coated chipboard carton used was an indented plastic liner tray, in the pockets of which the unwrapped candy pieces rested. The carton had a sealed cellophane overwrap. Although this tray had been in use for some time, the manufacturer's purchasing department had recently been offered apparently equivalent trays at a substantially lower price. Circumstantial evidence pointed to the tray because the trouble developed shortly after the first delivery from the new supplier. Laboratory tests confirmed the fact that the new trays were not of the same base plastic as the old and contained a volatile migrant which was actually identified, by gas chromatography, as a relatively harmless substance. While this case was settled out of court, the compensation to the candymaker certainly did not cover the loss of confidence in his brand name by those who happened to purchase the contaminated lot.

Laboratory Investigations

While, in general, the trend is away from the use of unlined cartons in the food industry, it was of interest to examine the volatile components of a series of selected printing and lithographic inks regarded as suitable for the decorative designs and labeling of food cartons. Some of the factors included in the investigation were rate of application, total volatile material deposited, rate of loss on drying (curing), and preliminary examination of volatile components by gas chromatography.

Differential weight determinations between equal adjacent areas of commercially printed cartons gave values for air-dry ink solids in the range of 6 mg. per sq. in. (yellows) to 10 mg. per sq. in. (blues). Fresh inks, containing approximately 75% solids (air-dry basis) were applied to new clay-coated chipboard at equivalent rates per unit of surface area. The samples were allowed to air-dry for an hour or until all tackiness disappeared and then were heated at 200°F. (93°C.) in a slow stream of nitrogen, which swept any volatile material into a series of cold traps maintained at temperatures ranging from 0°C. to –70°C. Unfortunately, it was found that the coated chipboard alone gave rise to a number of volatile substances (other than water) under these conditions which masked any contributions from the inks. The major component of the material obtained from the board was a waxy

substance, insoluble in ether, which exhibited a typical hydrocarbon spectrum in the infrared region.

In another series of experiments, the inks themselves were dispersed directly in ether, and insoluble matter was removed by filtration. The extracts were dried over sodium sulfate and slowly evaporated just to dryness in a stream of dry nitrogen, while immersed in a bath maintained at 0°–8°C. The residue was then warmed to 200°F. and violatile matter trapped as described above for the inked chipboard. It was found that after 3 hours the total weight of material collected at −70°C. amounted to 10–15% of the fresh weight of the sample, and about 1.5% of the weight of the air-dry solids.

Hypothetical Calculations

These rough preliminary data provide the basis for an interesting calculation. Assume a hypothetical carton having 200 sq. in. of surface of which 75% (150 sq. in.) is printed at an inking rate of 10 mg. per sq. in. Assume, further, that the resulting 1,500 mg. of air-dry ink is capable of liberating 1.5% of its weight as diffusible gaseous components. Now assume that, despite its presence only on the outside surface of the carton, the contents possess a high affinity for volatile substances, and diffusion into the interior is favored to the extent that half the total volatile matter is absorbed by the food. Thus one-half of 1.5% of 1,500 mg., or 11 mg., may become distributed in, say, 8 oz. (230 g.) of a bulky food. This is equivalent to roughly 50 p.p.m. of ink components in the food.

While it is obvious that the assumptions made in this calculation all represent exaggerated or maximum conditions, they are quite sufficient to show that the presence of organoleptically objectionable solvents or other ingredients in inks may, in the absence of effective vapor barriers, account for the type of field observation noted in the cookies described earlier. The very fact that the vast majority of inks used commercially in the production of food packaging do not result in off-flavors or off-odors is significant proof that "good manufacturing practice" is the general rule.

Volatile Ink Components

Other studies in progress in our Laboratories are designed to investigate the chemical identity of volatile ink components and to determine the correlation which may exist between concentration and detection by trained taste panels. Preliminary gas chromatographic examination of the volatile residues obtained as described above (condensable at −70°C.) have revealed the presence of upward of twenty individual components, ten of which are major. Aside from a few simple C_5- to C_8-hydrocarbons obviously derived from petroleum solvents, none have been completely identified to date. An additional group of five or six have been found to correspond with compounds present in the volatile fraction of bodied linseed oil, a common vehicle.

In the series of some 16 ink formulations included in the present work, none have been found capable of imparting detectable taste or odor to such bland foods as unsalted fresh butter or to milk chocolate, when exposed as air-dried films with the foods in sealed glass containers. All such tests have been made with taste panels of 15 trained judges following a triangular design.

Follow-up Studies

Mention has been made of the quantitative aspects of flavor and odor detection. Follow-up studies have been conducted in the case of the plastic candy tray which illustrate the degree of correlation sometimes demonstrable. In that instance, there was available a sensitive analytical method for determining the level of the volatile component. It was found to be present in the plastic to the extent of 0.40%. The tray weighed 13 g. and contained 350 g. of candy. Thus, there was a total of 52 mg. of volatile component available to be distributed in the candy. If migration had been 100%, this would have resulted in a contamination level of 150 p.p.m. Actual analysis of the candy showed it to contain 3 p.p.m., equivalent to 2% of the amount available from the tray. It should be kept in mind that no vapor barrier existed in this package, and the candy pieces were in actual contact with the plastic. Nevertheless, this may illustrate the type of equilibrium ratios prevalent in many instances. Had not the component in question possessed a highly characteristic and recognizable taste and odor, this degree of migration might have been considered insignificant.

When the volatile substance, in pure form, was intentionally incorporated in fresh unsalted butter, triangular taste panel tests showed that it could be detected at 8 to 10 p.p.m., whereas in milk chocolate, 3 to 4 p.p.m. were detectable. Obviously, the type and character of the food itself plays a significant role in the organoleptic response.

Summary

It will be evident that while many packaging materials may contain volatile substances, these will generally be dissipated before the finished carton or container comes in contact with food. Residual traces of such volatile substances which may remain in the package have traditionally been scrutinized with care, even prior to Jan. 1, 1958, if only to avoid those which could lead to consumer complaints. The majority are known to be common solvents which, if present in foods at levels approaching toxicological significance, would lead to serious flavor and odor problems, and are thus self-limiting for all practical purposes.

Although no major food additive problems, from a legal viewpoint, appear to threaten the food industry as a consequence of migratory, volatile substances in packaging, it is important that constant scrutiny and continued diligence in their avoidance be maintained. The suspicion with which the consuming public is being taught to view the presence of "chemicals" in foods is significantly bolstered by instances of obvious, though harmless, contamination which can be detected by the senses of smell and taste. Such cases tend to diminish public confidence in processed foods.

AN INSIDE LOOK AT FLAVORS THAT SELL

Look closely at a successful packaged mix. Taste the finished product, compare it. Why is it some flavors have compelling consumer appeal?

IFF flavors sell and resell for two important reasons. They are exclusively designed for your product, your markets—and they are the finest flavors available. IFF flavors are produced to withstand baking temperatures and to provide increased stability and shelf-life. They have stimulated new product ideas and created brand-building sales the world over.

To manufacturers interested in selling abroad, IFF can supply your flavor—uniform in taste—from any of its plants throughout the Free World.

For an inside look at flavors designed to sell your products, contact IFF.

FLAVOR DIVISION

iff

INTERNATIONAL FLAVORS & FRAGRANCES INC.

417 Rosehill Place, Elizabeth 2, N. J.

Leading Creators and Manufacturers in the World of Flavor

ARGENTINA AUSTRIA BELGIUM BRAZIL CANADA ENGLAND FRANCE GERMANY HOLLAND ITALY MEXICO NORWAY SOUTH AFRICA SWEDEN SWITZERLAND U.S.A.

why it is desirable to pursue

Flavor Research in the Bread-Baking Field[1]

By Lazare Wiseblatt

American Institute of Baking
Chicago, Illinois

It is clear from the number of research projects currently being pursued that interest in the flavor characteristics of yeast-raised baked foods is high. No mean share in this research activity is being borne by industry, either by direct participation or by financial support. Let us at the outset concede that, although knowledge for its own sake is an admirable objective, it cannot of itself justify the present efforts and expenditures by non-academic organizations. Since such a vigorous level of activity must be predicated at least in part upon the hope of practical benefits, it may be well to consider in some detail the nature and areas of such benefits.

Origin of Flavor Compounds

When a food processor incorporates distinctively flavored ingredients in his products, he usually does so with the foreknowledge of how the amounts and varieties of such ingredients are likely to affect the over-all flavor of the product. The bread baker is at a relative disadvantage, for most of his ingredients are very bland in themselves; the flavor of the finished article reflects almost entirely the complex and subtle changes which occur during processing. The baker's ingredients do vary to some extent as regards their flavor-yielding potential, but we are as yet almost totally ignorant of how to judge the relative flavor potentials of various ingredients having slight pre-existing flavor characteristics. Starting from the base of ignorance, the baker then must proceed through a most imperfectly understood series of biological and chemical changes, governed always by the overriding requirements of proper dough development, machinability, and physical performance during proofing and baking. Working under such empirical rules puts the baker at a serious disadvantage, particularly with the rigid requirements imposed by largely mechanized operation.

It is not surprising, therefore, that a major part of current flavor research in the baking field concerns itself with the role of fermentation. In this area lies the greatest hope of using scientific findings to direct the course of events, so that not only the physical properties but the flavor potential of the dough may be constrained to meet the desires of the baker. The fact that liquid pre-ferments have received the most attention reflects the greater convenience and precision of control with which the liquid systems can be handled in the laboratory, compared with conventional doughs or sponges. Thus the researchers have recognized the same advantages that bakers are turning to more and more at the present time. There is no serious incompatibility between findings that are being made with liquid brews and the processes that occur in sponges or doughs. The differences should be of degree rather than of kind.

We know beyond any doubt that flavor in a finished loaf of bread depends not only on the fermentation processes, but also to a great extent on the processes occurring in the oven. To some extent, compounds already known to exist in fermented doughs or liquid brews have also been detected in bread; but there are some prominent differences. The question of direct "carry-through" of volatile fermentation products into the bread is not answerable at present. We do not know, for example, whether volatile carbonyl compounds arising during fermentation remain as such or whether they may react further with proteins or other amino compounds to produce other volatile aromatic substances. We should like, further, to know to what extent those substances found in bread, but not in fermented dough, are consequent upon purely chemical processes as opposed to the participation of enzymatic reactions. There exists evidence that some of the enzymes in yeast are remarkably heat-resistant, thus permitting (in theory at least) very powerful catalysis by such enzymes during several minutes of the baking period when interior temperatures rise rather gradually.

The armed services have a keen interest in simplified bread production methods, using chemical leavening systems rather than fermentation by yeast. The use of chemical leavening agents has focused further attention on the lack of knowledge with respect to the role of fermentation in flavor production. The action of oven heat on an unfermented bread dough produces some flavor substances, but by no means approaches the flavor "spectrum" of yeast-leavened bread. However, because bread made from fermented dough, but with crust formation prevented, lacks truly satisfactory flavor, we must not fail to appreciate the part played by thermal reactions occurring during crust development.

[1] Presented at the 46th annual meeting, Dallas, Texas, April 1961.

Nature of Flavor Compounds

The list of compounds which various investigators have identified in liquid brews, doughs, bread, and oven volatiles has grown to fairly impressive proportions. In spite of these advances, however, it cannot be supposed by any stretch of the imagination that we are about ready to take these substances "off the shelf" and blend them into a synthetic bread flavor substitute. Substances whose identities are unknown – perhaps whose very existence has not yet been appreciated – remain to be discovered and characterized. About all that might be predicted about such substances is that they are likely to be of a less volatile nature than those which have heretofore been characterized.

One of the frustrating problems in any study of the nature of bread flavor is our dependence on the senses of smell and taste. Personal judgment of what qualifies as a contributor to flavor not only varies greatly between individuals, but will vary in a single individual from time to time. Unlike an instrument, a person cannot be calibrated to read-out the same result on each test of a given food product. If sufficient trained judges are available, a statistical treatment permits reasonably accurate classification of odors and tastes in terms of known substances. Such an approach will probably be desirable in assessing the contributions of substances which may be detected in the future. The possible pitfall here is the notoriously nonadditive nature of olfactory and taste sensations. In perfumery, for example, the whole is rarely the sum of the parts; the layman is likely to be shocked by the odors of some substances used as perfume fixatives, like musk or civet, let alone odorants such as indole.

Another difficulty in judging odors arises from the type of product bearing the odorous substances. In a slice of bread, we have a material of high porosity, with a very large surface area and consequent absorptive properties. The vapor pressures exerted by the various volatile constituents in the bread slice should then depend on these absorptive properties, which in turn will depend on the crumb structure, moisture content, etc. If we concede that odor perception is a function of the vapor pressures of the odorous substances, then it should follow that the odor we perceive in a slice of bread may be greatly different from that perceived if the same odorous substances were present as a simple mixture or aqueous solution. Slices of bread or crumbled bread can be vacuum-dried to the point where odor is no longer perceptible; but on moistening and warming slightly, an odor is again apparent. This phenomenon may be somewhat akin to that occurring when bread or rolls are "refreshened" by warming slightly in an oven.

The toasting of bread slices is not strictly comparable to the baking process, but there may be a close relationship between the products of browning in the two processes. Thus an investigation of the flavorants produced during toasting may yield some valuable information about corresponding compounds formed in bread crust.

Fate of Flavor Compounds

Fresh bread is a highly perishable food, undergoing rapid loss of palatability. Much is now understood about the chemistry of crumb firming, and about means for retarding the rate of firming. However, the phenomena lumped under the inclusive term "staling" comprise all the changes in texture, taste, and aroma. The individual factors are too closely interrelated to be judged independently by subjective means. What is rather obvious is that taste and aroma changes will invariably influence one's appraisal of staling. Equally obvious is the fact that these flavor changes are uniformly undesirable, and that arresting such alterations would enhance the useful storage life of bread.

Frozen storage does retard loss and alteration of flavor in bread, but not as completely as might be hoped for. Whether the changes are oxidative, hydrolytic, sorption-desorption phenomena, or combinations thereof, is not known and should be determined. Naturally, to do so requires first a thorough knowledge of the compounds involved. The prospect that flavor changes might one day be retarded as successfully as texture changes are now, should certainly appeal to the baker and consumer of bread.

Even if there is no practicable means (other than freezing) to stabilize bread against flavor changes, there remains one other distinct possibility: start with bread containing more of those flavor compounds which are simply lost on storage, as opposed to those which are converted into unpalatable reaction products. The same absolute loss of such compounds would then be less relative to the original concentrations, and the flavor loss would be far less apparent over a given period. To accomplish anything of this sort, the very least that must be thoroughly understood is the nature of the flavor substances; but this would permit only the deliberate addition of such compounds obtained synthetically. The more desirable approach, both esthetically and economically, requires that we know just where the flavorants originate, and how we can apply controls in formulation and processing so as to augment the desired constituents.

Classification of Flavor Properties

Under the subhead "Nature of Flavor Compounds," reference has already been made to the description of certain odors and tastes in terms of familiar substances. Such a scheme of classification would be of immense practical use; if a suitable "flavor language" could be devised whose terms would mean the same things to all bakers, communication problems would be greatly lessened. Two bakers could describe to each other the flavor characteristics of their products in terms as unambiguous as those by which they now discuss absorption, mixing and fermentation times, or loaf volumes. A desirable ancillary of such a terminology would be a set of intensity units, permitting both qualitative and quantitative description of complex flavor patterns.

The AACC has recognized the value of such a "language," and steps are currently being initiated by which it is hoped to develop a suitable terminology, easily understood and used by all concerned

with the flavor of bread.

Summary

Some of the practical as well as scientific advantages to be derived from flavor research have been suggested here. It must be amply clear that a good deal of intensive investigation is necessary before even minimum practical use can be made of the findings. To achieve all the mastery over quality, intensity, and stability of bread flavor which seems theoretically possible, if it can be done at all, will demand the most dedicated study. Fortunately for the possibility of reaching these goals, recent developments in microanalytical chemistry have put powerful research tools at our disposal. In the nine years since its initial development, we have seen gas-liquid chromatography refined to the extent that microgram instead of milligram quantities of organic compounds can be separated and estimated with precision. New column-packing materials and detection devices have pushed the useful operating temperature range steadily upward. At the same time, preparative-scale equipment has been improved, so that compounds may be isolated and purified in amounts ample for further studies. The challenges have been recognized for a long time; the "hardware" has only lately become available.

A most serious problem associated with commercial bread is the modest role of flavor in motivating the purchaser. If the baking industry is complacently satisfied with the present per-capita consumption rate, well and good; but it is safe to say that such complacency is conspicuously absent. No one who has been irresistibly tempted by fresh bread and rolls in the better European-style restaurants can deny that under these circumstances bread becomes a gastronomic treat rather than a convenience item. Therefore there is a real challenge to the baker who would increase his market; what happens in a fine restaurant could happen at the home dinner table as well. Any research that helps to place more flavorful bread in the home breadbox must, it is felt, succeed in emptying and refilling that breadbox oftener.

The problems associated with flavor in commercial bread will not solve themselves; trial-and-error methods of solving them are an extravagance as well as a gamble. The encouragement and expansion of flavor research may prove to be a wise investment in terms of providing practical solutions.

Flour Lipids

FROM PAGE 291

of peak 1 may include compounds of the phosphatidyl glyercol type, or phosphatidic acids. Cerebrosides are probably present.

At the points indicated by brackets in Fig. 6, beautifully formed crystals crystallized from the solutions. These proved to be sucrose and amounted to 5.5 and 3.1% of the compound lipids from high- and low-protein flours. This sucrose, apparently soluble in the mixed lipid solution, might have been removed by preliminary washes; none crystallized from gluten lipids. Presence of the sucrose serves to indicate the care necessary to ensure adequate separation and identification of individual lipid components.

Accurate comparisons between the two lipid mixtures await completion of detailed analyses for various components. It should be pointed out that, on the flour basis, compound lipids of the high-protein fraction were nearly three times those of the low-protein material. Qualitatively the two lipid mixtures are very similar, but there are quantitative distributional differences. The lipids from high-protein sources contain a lower percentage of sugar components than those from low-protein sources, and greater proportions of the nitrogen and phosphorus compounds occur in the first fractions. Differences are suggested in the ratios of phosphatidyl ethanolamine to phosphatidyl choline.

Conclusion

While we must still agree with Wren (24) that our results "serve to illustrate how little is known in general about the lipids of plant tissues and in particular about flour lipids," it is also true that the powerful new investigative techniques now in use are rapidly changing the situation. The answers to some of our long-standing questions have been moved from the realm of the possible to that of the probable.

Literature Cited

1. Barton-Wright, E. C. *Cereal Chem. 15:* 723 (1938).
2. Benson, A. A., and Strickland, E. H. *Biochim. et Biophys. Acta 41:* 238 (1960).
3. Borgstrom, B. *Acta Physiol. Scand. 25:* 101 (1952).
4. Carter, H. E., Hendry, R. A., Nojima, S., and Stanacev, N. Z. *Biochim. et Biophys. Acta 45:* 402 (1960).
5. Carter, H. E., Gigg, R. H., Law, J. H., Nakayama, T., and Weber, E. *J. Biol. Chem. 233:* 1309 (1958).
6. Carter, H. E., McCluer, R. H., and Slifer, E. D. *J. Am. Chem. Soc. 78:* 3755 (1956).
7. Cole, E. W., Mecham, D. K., and Pence, J. W. *Cereal Chem. 37:* 108 (1960).
8. Cookson, M. A., and Coppock, J. B. M. *J. Sci. Food Agr. 7:* 72 (1956).
9. Coppock, J. B. M., Fisher, N., and Ritchie, M. L. *J. Sci. Food Agr. 9:* 498 (1958).
10. Daniels, D. G. H. *Chem. & Ind. (London) 1958,* p. 653.
11. Fauré, M., and Morelec-Coulon, M. J. *Compt. rend. 236:* 1104 (1953).
12. Fisher, N., and Broughton, M. E. *Chem. & Ind. (London) 1960,* p. 969.
13. Glass, R. L. *Cereal Sci. Today 5:* 60 (1960).
14. Hanahan, D. J. Lipide chemistry. Wiley: New York (1960).
15. Mason, L. H., and Johnston, A. E. *Cereal Chem. 35:* 435 (1958).
16. Mecham, D. K., and Mohammad, A. *Cereal Chem. 32:* 405 (1955).
17. Mecham, D. K., and Pence, J. W. *Baker's Dig. 31* (1): 40 (Feb. 1957).
18. Nelson, J. H., Glass, R. L., and Geddes, W. F. Abstr. 45th Ann. Meeting AACC, 1960; p. 32.
19. Stevens, D. J. *Cereal Chem. 36:* 432 (1959).
20. Wintermans, J. F. G. *Biochim. et Biophys. Acta 44:* 49 (1960).
21. Winterstein, E., and Hiestand, O. *Z. Physiol. Chem. 54:* 288 (1908).
22. Winterstein, E., and Smolenski, L. *Z. Physiol. Chem. 58:* 506 (1909).
23. Wren, J. J. *J. Chromatog. 4:* 173 (1960).
24. Wren, J. J., and Elliston, S. C. *Chem. & Ind. (London)* 1961, p. 80.

The twentieth anniversary of enrichment makes a perfect springboard for putting new emphasis on the nutritional benefits of your enriched products. Display the word "Enriched" in your package and promotional material. Stress the fact that enrichment means extra vitamins and iron—not extra calories.

As a pioneer in vitamin research and production, Merck is proud of its role in helping to make enrichment possible. Be proud of your own role in bringing the miracle of enrichment to the public.

MERCK CHEMICAL DIVISION
MERCK & CO., INC. · RAHWAY, NEW JERSEY

MERCK VITAMIN MIXTURES FOR FLOUR ENRICHMENT

low between-lab agreement with official methods evokes new

Filtering Devices for Crude Fiber Analysis

By Kenneth E. Holt

Archer-Daniels-Midland Co.
Minneapolis, Minnesota

When the analytical chemist is requested to run a crude fiber analysis using one of the official methods as published by AOCS, AOAC, or AACC, he immediately becomes aware of the empirical nature of the method and its potential lack of precision. This is due to the choices he has in selection of equipment, reagents, and operating techniques.

In 1956 R. T. Doughtie requested a crude fiber analysis on eleven of the oilseed meal samples that were submitted to the AOCS Smalley Check Sample participants (1,4). Thirty-three of the competing analysts reported crude fiber results, and a statistical analysis of these data showed that the agreement between laboratories on a 95% confidence limit basis was 2.31%.

These results were particularly distressing to the National Soybean Processors Association, who had just established a trading rule on soybean meal based on maximum crude fiber. Discounts of 1% of delivered price were allowed on each 0.2% fiber above maximum of 7% on the 44% soybean meal and each 0.1% fiber above maximum 3% on the 50% soybean meal. The NSPA requested the AOCS Oil, Seed, and Meal Committee to investigate the Crude Fiber Method and, if possible, improve its precision and accuracy.

Project Begins

R. T. Doughtie initiated the project by sending a questionnaire to the 33 Smalley Committee participants. The 13 items on this questionnaire covered the types of equipment, reagents, and techniques used by the participating laboratories. A tabulation of the 31 replies showed that no two laboratories were running the Crude Fiber Method in exactly the same manner. Also, in an effort to increase precision, many of the laboratories had taken undue liberties with the method, particularly in equipment design.

In 1957 an AOCS-AOAC Crude Fiber Liaison Committee was formed with seven members from each of the participating organizations. The author was selected as chairman and R. T. Doughtie of USDA, vice-chairman.

Some General Principles

The Committee agreed that the general principle of determining crude fiber by digestion with acid and caustic must be maintained. Technical literature is full of crude-fiber results based on the present method, and any drastic changes in procedure would further confuse rather than clarify the problem. The Committee approached the problem by 1) evaluating each and every step in the Crude Fiber Method, 2) determining its effect on accuracy and precision, and then 3) establishing specific procedures. Three Interim Reports covering the findings of the Liaison Committee studies were published in the Journals of the AOCS and AOAC (2,3,5,6). Some of the items examined by the Committee were: sample preparation, digestion equipment, digestion solutions, preheating of solutions, time of digestion, antifoam agents, asbestos, filtering devices, crucibles, and ignition temperatures. Hundreds of crude-fiber analyses have been run by the Committee. Through a statistical analysis of the data, all of the items except sample preparation have been resolved and specific instructions written into a proposed method. The sample preparation is now under study and should be completed within the next few weeks.

Filtering Step

In the study of the method, the filtering step appeared to present the biggest single source of error. The use of a cloth for filtering the crude fiber was considered unsatisfactory by the majority of the Committee members, and the Committee spent considerable time investigating various filtering devices that would eliminate the use of the cloth in the filtering step. Three devices were particularly attractive: 1) the Oklahoma State Filter Screen proposed by Richardson and Kendall [1], 2) the modified Buechner funnel proposed by Van P. Entwhistle of the California State Department of Agriculture, and 3) an adaptation of the Shimer filtering funnel proposed by F. W. Quackenbush of Purdue University.

Oklahoma State Filter Screen

This device utilizes a 200-mesh stainless-steel screen attached to an inverted metal funnel. The design proposed by Richardson and Kendall requires soldering the screen to the funnel. This does not permit the cleaning of the screen, and after some usage the screen will clog, losing efficiency. In the ADM Laboratories we modified the Richardson-Kendall design by providing a

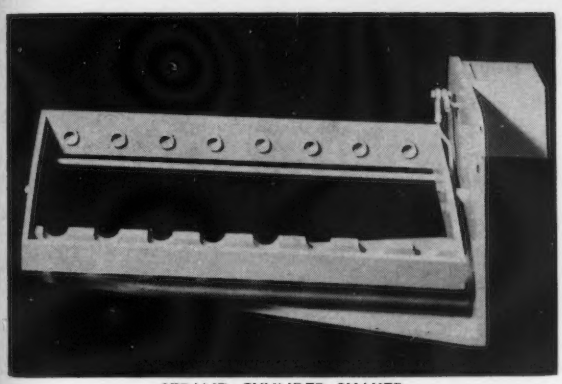
[1] Richardson, W., and Kendall, J. Unpublished paper, Oklahoma State Board of Agriculture.

Strand Shaker Equipment

For Sedimentation Test

Strand Shaker equipment is in use by both Government grading laboratories and private industry. The Strand equipment, specifically and carefully designed for the new sedimentation test, fulfills official requirements. To meet exacting standards of performance, quality and economy—

SPECIFY STRAND SHAKER EQUIPMENT!

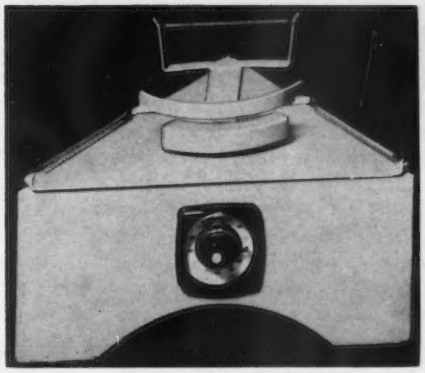


STRAND CYLINDER SHAKER

- Triangular base for greater stabilization — Rubber shock mounted
- 40 RPM fractional H.P. gearmotor direct drive — 110 volt 60 cycle AC
- Crankshaft actuation — designed for balanced shaker rack when loaded with cylinders
- Cylinders held securely in shaker rack by self-centering, spring-actuated sockets designed to fit over cylinder stoppers
- 40 cycles per minute oscillation speed
- 60° rocking motion — 30° each way from horizontal
- Cylinder rack and base of carefully fitted wood construction specifically designed to provide greater cushioning effect and resilience than afforded by use of steel. Reduces cylinder breakage hazard

- Triangular base for greater stabilization — Rubber shock mounted
- 200 RPM fractional H.P. gearmotor direct drive — 110 volt 60 cycle AC
- Counter-balanced table — equipped with thrust bearing
- Simple spring hold-down for sieve assembly prevents rattling or vibration — sieve assembly can be instantly removed and replaced
- Built-in precision automatic reset timer, accurate to 1/10th second to provide 300 oscillations over 90-second interval
- All-steel construction (glassware breakage is not a factor since there is no direct contact)

ALL EQUIPMENT FULLY WARRANTED



STRAND SIEVE SHAKER

Exclusive National Distributor

HEGMAN INC.

506 Grain Exchange Building

Minneapolis 15, Minnesota **FE 5-2247**

Complete Sedimentation Test Kits Available

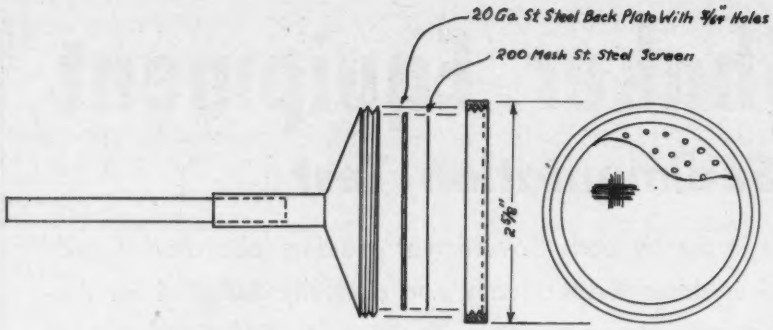


Fig. 1. Oklahoma State filter screen.

screw-type ring to hold the screen in place (Fig. 1); thus the screen can be removed at any time for easy cleaning.

To use the Oklahoma State Filter Screen a suction is applied to the stem of the funnel and the inverted funnel inserted into the digestion beaker; thus filtration is accomplished without removing the solid material from the beaker. The wash steps, also, take place in the digestion beaker. When filtration is completed, releasing the vacuum and applying air pressure to the stem of the funnel will remove the fiber pad from the screen completely and cleanly. This filtering device provides rapid filtration with minimum loss of fiber.

California State Modified Buechner Funnel

A two-piece polyethylene Buechner into which a 200-mesh stainless-steel screen has been heat-sealed (Fig. 2) has been proposed by Van P. Entwhistle. This device is used in the same manner as a standard Buechner funnel. While the material must be removed from the digestion beaker, many of the Committee members felt this provided more complete washing and faster filtration than the Oklahoma State device. When the wash steps are completed, the fiber pad is removed from the Buechner by air pressure. This is done by uncoupling the two parts, holding the thumb over the stem of the funnel, and quickly slapping them together. The wafer-thin fiber pad comes off cleanly and completely.

Shimer Funnel

F. W. Quackenbush's Shimer funnel (Fig. 3) uses a small perforated porcelain plate covered with asbestos as the filtering medium. When the filtration and wash steps are complete, the device is disconnected from the vacuum and a glass rod is inserted through the stem of the funnel to remove the asbestos-fiber plug. The snug-fitting asbestos plug will wipe the sides of the funnel clean, giving a complete transfer. Because this funnel has a small filtering area, filtering time is longer on some types of samples. Since this device had no advantages over the California or Oklahoma State devices, it was eliminated from consideration.

The Liaison Committee was equally divided on preference regarding use of the Oklahoma State Filter Screen and the California State Modified Buechner. However, all members agreed that both devices were superior to cloth for the filtration step. Since both of these filtering devices employ the 200-mesh screen with vacuum filtration, it was decided to permit the use of either, and the method was written to accommodate both. Table I shows precision of the method as it is being presented to the AOCS and AOAC for their approval and adoption.

In Table I the precision shown for the Modified Cloth Method is the use of the filter cloth with other factors such as digestion temperatures, preheating solutions, anti-foam, ignition temperatures, etc., modified to conform to the results of the Committee's findings and

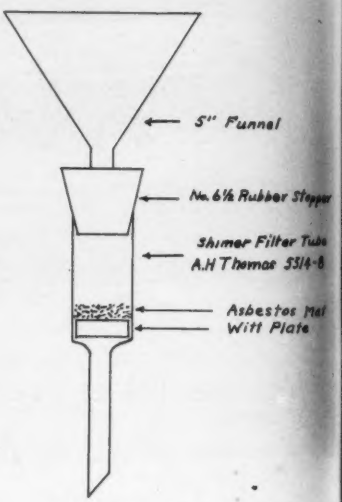


Fig. 3. Shimer filter assembly.

Table I. Precision Crude Filtering Devices Based on 95% Confidence Limits

Device or Method	Lab. Agreement within	between
Oklahoma State Filter Screen	0.48	0.68
California Modified Buechner	0.68	0.92
Combination Oklahoma and California	....	0.79
Modified Cloth Method	0.86	1.28
1956 Smalley Check Sample		2.31

decisions on these items. The between-laboratory agreement is given for the combined results of the Oklahoma State and California filtering devices, since the method allows the use of either. It must

(Please turn to page 308)

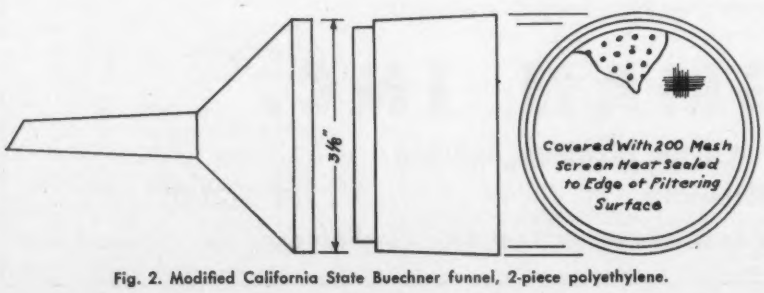


Fig. 2. Modified California State Buechner funnel, 2-piece polyethylene.

Givaudan offers you
a complete family of high quality

IMITATION ESSENTIAL OILS

always uniform...always available!

Givaudan offers you a wide and interesting variety of imitation citrus and spice essential oils—each rivaling in strength and quality the finest natural oils.

But quality is only one of the many advantages of these Givaudan imitation essential oils. They are *always* uniform in strength and aroma...*always* available in desired quantities...*always* economical and stable in price. Produced domestically by Givaudan with materials completely under Givaudan's control, they provide you with a completely reliable domestic source of supply. May we demonstrate how accurately they can meet your specific requirements?

Givaudan Flavors Inc.

321 West 44th Street
New York 36, N. Y.

People, Products, Patter

• • • People

John F. Bozman promoted to southeastern regional sales manager, Sterwin Chemicals, Inc.; will supervise sales in Alabama, Georgia, Florida, North and South Carolina, and Tennessee, from headquarters in Atlanta. He joined Sterwin in 1946 as technical sales representative, was later appointed a district manager.

Stanley Foster, associated for the past 10 years with International Div. of Red Star Yeast & Products Co., leaves that firm to head his own company, the Foster Marketing Co., New York City; has most recently been vp of Universal Food Products, Ltd., subsidiary of Red Star Yeast located at San Jose, Costa Rica.

Richard T. Fukuda joins Red Star Yeast & Products Co. as head of cereal chemistry lab., yeast division; formerly with food research division of Armour & Co., Chicago. He will supervise the control bakeshop and conduct research in applied baking technology; replaces **Paul Merritt** who retired earlier this year after many years with the firm. **Joseph Becker** joins Red Star as bakery service Technician in St. Paul, Minn., branch; formerly with Swift & Co. **Justin Gutting** named bakery technical service representative at Dallas, Texas; formerly with Patrick Cudahy Co.

Eugene F. Garner appointed manager, flour development and improvement, Industrial Div., The Pillsbury Co., coming from Quartermaster Food & Container Inst., Chicago; previously was associated with Schlitz Brewing Co.

Harold B. Korn appointed field sales manager of food division, National Starch & Chemical Corp. He joined the company in 1946; has been district sales supervisor for Eastern U.S. and responsible for National's food starch products throughout both countries.

Layton Perry transferred to San Francisco operations, General Mills, Inc., from El Reno, Okla., division.

James L. Rankin, president of Foremost Daries, Inc., named a director of American Institute of Baking—the first from the West Coast and the first from the dairy industry. Rankin became president of Foremost (headquarters, San Francisco) in March 1961, previously was vp and director of the Pillsbury Co.

Oscar Skovholt, director of laboratory services, Quality Bakers of America Co-op., Inc., for 25 years, died September 21 after an operation, at age 64.

Dr. Skovholt was a recognized authority in cereal chemistry and was instrumental in developing improved methods of evaluating bakery ingredients. He was president of the AACC, 1944-1946, and was active in many other scientific organizations, including ACS, AAAS, IFT, and Sigma Xi.

Dr. Skovholt's participation in the AACC began in 1924. He was an active member on numerous technical and administrative committees of the Association during the period of his membership. His presidency was unusual in that it lasted over two years, because of wartime pressures. He was frequently called upon by the Board of Directors to advise on special problems dealing with technical and professional matters, and was a staunch supporter of the professional role of the cereal chemist in the milling and baking industry.

He is survived by his wife, Annabella, and two sons, Donald and Richard. Burial was in North Dakota, where he was born.

Kenneth W. Ward elected vp of Foremost Dairies, Inc. He is general manager of Industrial Division and new headquarters are in Burlingame, Calif.; has been with Foremost or predecessor companies since 1926 and has held executive positions in Gustine, Calif., Frankfort, N.Y., and Appleton, Wis., where he was president of Western Condensing.

• • • Products

• **Moisture analyzer.** The Boonton Polytechnic Co., Inc., believes that its new moisture analyzer is the only meter of its type producing the results desired by processors of chemicals, foods, plastics, pharmaceuticals, paper, packaging, and agricultural materials. A high degree of accuracy in many foods including cereals is assured by the manufacturer. The entire range of moisture is stated to be 0 to 0.04%, necessitating an extreme sensitivity. The test requires 5 minutes, enabling 48 test samples to be run through in 2½ hours; the equivalent amount of tests by the oven weight loss method would have required 5 hours per test or a total of 240 hours. (1)

• **Roche reduces price of vitamin A.** Hoffman-La Roche Inc. has announced a decline in cost, effective September 1 and retroactive for 30 days, of both its liquid and its dry forms of vitamin A. The new base price of all liquid forms is 7 cents and of the dry forms, 9.5 cents per million units, from 9.5 and 13 cents, respectively. These price reductions, it is stated, are the result of economies brought about by advances in manufacturing processes developed by Roche research. When Roche vitamin A was originally introduced in 1950, the cost was 30 cents per million units. Widespread customer acceptance has led to expanded markets, production "by the tons," and successive price declines. (2)

• **A solution-metering pump** for precise delivery of minute quantities of liquids is being marketed by Beckman Instruments, Inc., for any application where small quantities of fluids must be precisely measured. Examples of such work are drug infusion studies, organic synthetic research, reaction rate

studies, and pilot plant operations. The pump is available in four ranges: 0–2, 0–5, 0–10, and 0–20 ml. per minute. (Bulletin 794.) **(3)**

• **Sedimentation Test equipment** is now available from Hegman, Inc. of Minneapolis. The company is offering complete kits which include all necessary items for the complete determination according to the 6th Edition of Cereal Laboratory Methods. Shakers, sieves, graduated cylinders, etc., may be ordered as separate items. **(4)**

• **The Cahn GRAM Electrobalance,** recently put on the market, actually performs much better than was originally stated, according to the Cahn Instrument Co., Paramount, Calif. They state that sensitivity (ultimate precision) is 0.1 instead of 1.0 γ, and precision during taring is 10 p.p.m. of total load. These new specifications are based on the production test records of the first 100 instruments, and apply to them as well as to future production. The manufacturer was reluctant to claim a sensitivity of 0.1γ until he had made a substantial number of the instruments. This performance, the company states, makes the Cahn GRAM Electrobalance the most sensitive balance on the market, and opens many new applications for gravimentric determinations. **(5)**

• **Industrial pH analyzer.** Model J, an all-new system, is being marketed by Beckman Instruments, Inc.; it includes pH analyzer, new electrodes, and new electrode mounting chambers. The instrument is available with both milliampere and millivolt output for use with any potentiometric or current-type recorder; also with millivolt output only. It employs an AC stabilized amplifier which provides stability of 0.01 pH per 24 hours over ambient temperature range of −20° to +122°F. Among new features are electrode immersion and flow chambers. The manufacturer offers further information on request, about the Model J pH Analyzer, new glass and reference electrodes, and electrode chambers. (Bulletin pH 4030.) **(6)**

• **Bread fermentation flavor.** VICO 400, a natural fermentation flavor for use in baked goods, has been accepted by the FDA as an optional ingredient in standardized bakery products at levels up to 2 parts by weight of flour used. This announcement by Vico Products Co. states further that the flavoring is now available in two types, with or without dough-softening effect; it may be used in yeast-leavened baked goods to intensify and balance natural fermentation flavor. They also report, from field evaluations, that its use has resulted in improved tenderness and mouth feel; masking of objectionable flavors attributed to high levels of mold and rope inhibitors; better dough-handling properties; and protection against abuse through thawing and refreezing of products. Ask for Technical Bulletin No. 400-3, giving suggested use levels in English muffins, crumpets, dinner rolls, brown-and-serve rolls, white bread (continuous process), specialty breads, frozen dough, French crescents, butter gems, and high-shortening products. **(7)**

• **Udy Protein Analyzer finds new uses.** After successful application in the determination of protein in whole grain, the Udy Analyzer is now being used with dehydrated alfalfa, soybean meal, and liquid or powdered milk products. The Udy test is based upon dye-binding with the protein in the biological material being tested. The manufacturer claims excellent correlation with the standard Kjeldahl test, and results within five minutes instead of the usual 2-3 hours. Hegman, Inc. of Minneapolis is the distributor. **(8)**

• • • Patter

Wheat germplasm released. The possibility of commercial hybrid wheat becomes at least a small step closer to reality: Kansas Agricultural Experiment Station will begin releasing hard red winter wheat germplasm, that produces no seed when it is self-pollinated. It can be released, however, only when enough seed is available to fill requests of bonafide plant breeders, who may obtain 25 kernels each. These seeds should be male-sterile but female-fertile, and should grow like hard red winter wheats.

Development of cytoplasmic male-sterile wheat lines has been a major problem to be solved before hybrid wheat, similar to hybrid corn, could be developed. The original material for research came from Japan. To produce it, the cytoplasm of a grass relative of wheat was transferred to wheat. The material being released also contains characters of several varieties of hard winter wheats. It will take several years, at best, to solve the problems still remaining before hybrid wheats become practical.

• • •

Sargent opens Western division. A new office-warehouse building has been opened on a 2-acre site in Anaheim, Calif., by E. H. Sargent & Co., containing 38,000 different items of scientific equipment, apparatus, and chemicals. The office area has been designed to speed the flow of paperwork from receipt of order through checking of stock cards to forwarding orders to the warehouse for shipping. The warehouse features modern adjustable shelving on which stock is set up numerically by catalog number. Special feature of the division will be a complete demonstration laboratory, occupying 6,000 sq. ft., where various instruments and equipment are set up for immediate demonstration and customers may try them out before purchasing.

• • •

Achievement award open. Nominations are in order for the 1962 Food Technology Industrial Achievement Award. Its purpose: to recognize and honor an outstanding food process and/or product which represents a significant advance in the application of food technology to food production, and which has been successfully applied to commercial operation for at least 6 months. A bronze plaque is presented to the company or institution receiving the award. Engrossed plaques will be given the individuals judged to have made major contributions to the achievement, either through basic research or development. The 1961 award was made to Swift & Co. and five scientists for the ProTen Process of meat tenderizing.

Nominations for the 1962 award should be made in letter form to Institute of Food Technologists, 176 West Adams, Chicago 3, and should include name of company or institution and name of product or process, together with a description. Also required are: reasons for considering the product or process meritorious; a list of individuals chiefly responsible and mention of their individual contribution; and an indication of time and extent of commercial utilization. Deadline for nominations is Dec. 1, 1961.

• • •

1962 Convention, ASBC. Under the direction of Dwight L. Baker,

general convention chairman, plans for the 1962 convention of the American Society of Brewing Chemists have been well started. Headquarters will be at the Schroeder Hotel, Milwaukee, and dates are May 20–24.

Prospective authors may contact the chairman, R. B. Petersen, Anheuser-Busch, Inc., St. Louis 18, Mo. Particular emphasis is to be placed on new developments in analytical equipment and methods. Further scope of the program is in practical applications of statistical procedures to scientific and production problems.

• • •

A feed plant feasibility workshop was held October 2 and 3 at Kansas State University, conducted by formula feed extension specialists. Purpose of the workshop, the second held at KSU, is to give assistance in making sound decisions to persons interested in building a new feed mill or expanding a present set-up. Participants were taken through step-by-step appraisal and planning processes, and a wrap-up session was devoted to discussions on "Putting the Plan into Action," by the extension staff. "Anticipated changes in production of meat, milk, and eggs in Kansas and in the U.S.," they were told, "make it imperative that those now in the formula feed business or those considering entering this field carefully analyze their current situation befor investing any sizable sums of money."

• • •

The Food Protection Committee of the National Research Council recently released a new publication entitled "The Use of Chemicals in Food Production, Processing, Storage, and Distribution." Copies are available at 50c each from: National Academy of Sciences—National Research Council, 2101 Constitution Ave., Washington 25, D.C.

• • •

Pesticide methodology. The Methods Clearing House Committee of the Association of American Pesticide Control Officials, Inc., keeps members fully informed of the latest developments in pesticide methodology. At least twice a year, the Committee mails out copies of analytical methods to members of the Association and to various state, federal, and industrial laboratories. The methods are those which have proved useful in the laboratories of the Pesticides Regulation Branch of the USDA in analyses of pesticide formulations, but have not yet been adopted by the AOAC because of the lack of collaborative study. Dr. Thomas H. Harris, Head, Chemistry Section, Pesticides Regulation Branch, USDA, is chairman.

• • •

The 16th Midwest conference of the American Society for Quality Control was held October 19 and 20 at the Chase-Park Plaza Hotel, St. Louis. The theme was "The Universality of Statistics." Papers scheduled under Quality Control included "Taste Testing" and "Quick and Accurate Frequency Distribution Analysis." Under Industrial Statistics, among others, were "Putting Experimental Designs into Practice," and "Computerized Quality Control." Expository papers included such provocative titles as "Teaching Electronic Brains to Think," and "Efficient Use of Inefficient Statistics." Training courses were given on basic and advanced quality control and on life testing and reliability.

• • •

A new bakery mix plant at Lockport, N.Y., expands the bakery business of International Milling Co. with a complete selection of mixes for the baking industry. The four-story plant includes a laboratory, warehouse, and mixing lines. Flour manufactured in the adjoining company mill is stored in 34 bulk bins for blending to specified formulas and is conveyed pneumatically to the mix process. Other ingredients are stored in a series of bins having a capacity of 1,500 lb. each. Sugar is unloaded pneumatically from airslide cars into horizontal bulk storage bins.

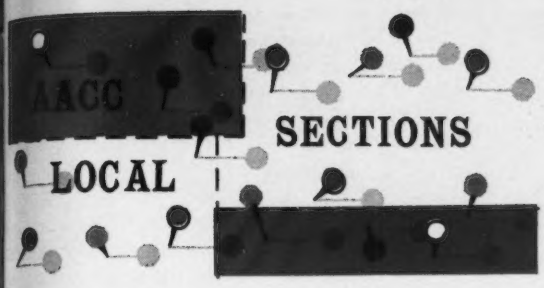
All mixing in the plant is controlled from a central panel board, with such flexibility that operators can "shut off one type of mix and go to a completely different formula almost on a moment's notice," according to the announcement.

also be pointed out that these precision figures are not applicable to high-fiber materials such as alfalfa meal, or materials that are difficult to filter such as yeast.

It is the conclusion of the Liaison Committee that this is the best precision we can expect and still retain the present principle of the Crude Fiber Method. The Committee made one attempt to modify the principle by eliminating the intermediate filtering step through neutralization of the acid. Results produced were not satisfactory and no further work along this line is planned. It is recommended that the AACC review the work of the AOCS-AOAC Liaison Committee and study the method that has been developed by the Committee.

Literature Cited

1. American Oil Chemists' Society. Subcommittee on Oilseed Meal, Smalley Report (April 1957).
2. Association of Official Agricultural Chemists. Crude Fiber Liaison Committee, Second Interim Report. *J. Am. Oil Chemists' Soc. 36:* 545 (1959).
3. Association of Official Agricultural Chemists. Crude Fiber Liaison Committee, Third Interim Report. *J. Am. Oil Chemists' Soc. 38:* 150 (1961).
4. Doughtie, R. T., Jr. *J. Assoc. Offic. Agr. Chemists 41:* 441 (1958).
5. Holt, K. E. *J. Assoc. Offic. Agr. Chemists 32:* 222 (1959).
6. Holt, K. E. *J. Assoc. Offic. Agr. Chemists 43:* 335 (1960).



Chesapeake Section met September 28 for social hour and dinner at the Domino Restaurant, on Route 1, a mile south of Beltsville, Md., across from the Plant Industry Building. David Cavanaugh of National Starch and Chemical Corp. spoke on "Pregelatinized Starches for the Baking Industry," a relatively recent development that has filled a need and found wide application. Mr. Cavanaugh, a graduate of Manhattan College of New York, has been a technical sales representative with National Starch for the past 10 years.

• • • •

Tri-Section meeting dates for this fall are October 27 and 28 and the place is Manhattan, Kansas. On Friday, Open House will be held at the new Milling Building, KSU. After smorgasbord at the Wareham Hotel and presentation of the Past President's Award, President James Evans will discuss current AACC affairs.

The Saturday session at the Little Theater, Kansas State Union, will present: "Starch Endosperm Cell Walls in Hard Wheat Flour"—William Schulze; "Application of Alveograph to Testing for Quality"—Merle Shogren; "Bake Properties of Prepipe Grain Dried at Varying Temperatures"—Carl Moseney; "How Much Is Pigment Worth?"— Waldon Hastings; "Comparison of Methods for Determination of Lysine"—Y. Pomeranz; "Microtechniques for Measurement of Enzymes"—James Fleming. At noon luncheon in the Union, President Evans will speak on "Starch Phosphates."

• • • •

Niagara Frontier and **Toronto Sections** joined with Niagara District AOM on September 23 for their 11th annual Trans-Border Meeting, at Prudhomme's Garden Center Motor Hotel, Vineland Station, Ontario. Morning program items were: "Problems of Future Survival for the Food Industry"—Joseph H. Hulse, Maple Leaf Mills Ltd.; "Pneumatic Conveying and Bulk Storage"—Donald Noyes, Selina Mfg. Co. Inc. and Jarvis Construction Co. Inc.; "Packaging of Bakery Products"—S. J. Kalich, Christie Brown & Co. Ltd. Pictures of the Maple Leaf fire and mill reconstruction were shown by Stuart Butler of Maple Leaf Mills.

Afternoon papers were: "Flour Management Looks at Flour Control Laboratories"—Donald Mennel, Mennel Milling Co.; "Pregelatinized Starches in Baking Technology"— J. F. McGowan, National Starch and Chemical Corp.; and "Semolina Milling"—Alan Duckworth, Maple Leaf Mills Ltd.

Cocktail party and banquet in the early evening were followed by late entertainment, dancing, and refreshments.

• • • •

New York Section held its second fall meeting on October 17. Peter Pirrie, Engineering Editor of **Bakers' Weekly**, reported on new developments introduced at the American Bakers' Association Exposition at Atlantic City—"with emphasis on developments in automation and process control."

Details on the Sept. 12 meeting not available for last month's report: Samuel A. Matz, speaking on "Texture Deterioration in Frozen Bakery Foods," pointed out that both the USDA and the AIB have published excellent work in gross organoleptic changes in baked goods during storage and thawing. His emphasis was, therefore, on molecular and microscopic changes. Factors discussed were ice-crystal formation, "texture staling," movement of water in frozen goods, chemical and enzymatic changes, and status of gels (including gluten) during freezing and thawing. He also mentioned the importance of stability of fat emulsions and fillings of various types. The most important factor in the maintenance of good texture, he said, is rapid freezing which provides small and uniform crystal size. Dr. Matz is manager of the refrigerated dough department of Borden Foods Co., Syracuse, N.Y.

New members: F. J. Bowman, Traders Oil Mill Co.; Richard G. Chin, The Fleischmann Labs; James W. Duros, Atlas Chemcal Industries, Inc.; Joseph J. Hickenbottom, Standard Brands, Inc.; Herbert Horlicks, Ward Baking Co.; Gabriel P. Lensack, Atlas Chemical Industries, Inc.; Mark Wegner, Ward Baking Co.

• • • •

Southern California Section met on October 3 at Rodger Young Auditorium, Los Angeles. Norman F. Johnston of Process Chemicals Co., Santa Fe Springs, Calif., a Section member, said on the subject "From Emulsifiers to Food Surfactants," that the the lowly food emulsifier has come of age; it has been educated to a complex, sophisticated entity known as the food surfactant and the limited applications of emulsifiers have been replaced with the food surfactant's remarkable versatility. This adds plus-values to our everyday food products and assists in the development of new ones. New food products are in the offing, he added, — created by selection and blending of the desired nutrients with appetizing flavors and colors. The attractive texture, consistency, and mouth feel that gain wide customer acceptance are finished off by introducing the right food surfactant. The program was considered a most interesting and beneficial one.

A joint meeting with Northern California Section in Fresno is scheduled for October 27.

• • • •

Lone Star Section met Sept. 8–9 at Lake Murray, Ardmore, Okla. A brisk program included talks by Dale Johnson, Central Soya Products, Chicago, on the manufacture of soy flour and its use in bakery products, and by Claude Neill of Enid Board of Trade Lab. on protein techniques, the latter with slides.

New officers were elected: Don Abbott, chairman; Jeff Schlesinger, vice-chairman; Cato Christensen, sec.-treas.

The group agreed to register opposition to the Zeleny sedimentation test to the USDA and the Secretary of Agriculture.

New members: Tom Chase, Enid Board of Trade, Enid, Okla.; and Ray Phelps, Wichita Falls Grain Exchange, Wichita Falls, Texas.

• • • •

Midwest Section held its first meeting of the season on October 2 at the Builders Club. A panel discussion on "New Developments in Packaging of Cereals and Baked Products" was held. Included on the panel were: Lou Hayhurst, National Dairy Company; Charles Woodcock, Post Division, General Foods Corp.;

Douglas Kirk, Quaker Oats Co.; and W. Scott Hassler, Container Laboratories. The panel members discussed the importance of package development simultaneously with product development; stressed convenience of package opening as well as protection against moisture; and described new developments in packaging machines and sealing equipment.

The next meeting of the section will be a Wheat Symposium held on November 6 at 4:00 p.m. at the Builders Club, under the direction of Welker G. Bechtel, Director of Laboratories, American Institute of Baking.

• • • •

the President's Corner

news of the association

New Delinquent Date

AACC members are reminded that January 1st is the new delinquent date for membership dues. This action was approved at the Annual Meeting last April in Dallas. Your cooperation will save both time and money for the Association, and thereby, yourself.

Advertising Support

Most members of the AACC know that this journal derives a substantial proportion of its financial support from advertising. Since its inception in May of 1956, the volume of advertising has grown. This has meant a better publication in terms of both quality and quantity.

Some associations not only support their publications by advertising, but help subsidize their entire organization. This usually means increased services for the members at no increase in dues.

If AACC members would let their suppliers know that they read *both* the editorial and advertising in CST, space selling would be much easier. Each of us should do our part in supporting CST among our suppliers. Let the allied trades know when we are interested in new products they advertise and especially where we saw the ad. When writing or talking to advertisers, never fail to say you saw their advertisement in CST, or what is just as important that you did not see their ad. They are as interested in knowing where to advertise as we are to tell them. But the final proof is in the response they get from you, the reader.

JAMES W. EVANS

New AACC Members

BEHAN, VERN S.,Blaine Thompson Brokerage Co., 25½ Highland Park Village, Dallas, Texas

BUIST, RONALD V., *Head Chemist,* John Darling & Son Pty. Ltd., Walker Street, Rhodes, N.S.W., Australia

COCHRAN, GENE B., *Manager,* Traders Protein Div. (Traders Oil Mill Co.), 3355 Cordone St., Fort Worth, Texas

DENTON, ALFRED D., JR., *Research Chemist,* The Frito Company, 3420 Singleton, Dallas 12, Texas

FORTNEY, CECIL G., JR., *Manager,* General Foods Corp., Post Division, Corn Mill Labs, Kankakee, Ill.

GAFFNET, HENRY E., *Associate Director of Research,* U. S. Testing Co., 1415 Park Ave., Hoboken, N. J.

GLUSKIE, HAROLD C., *Chief Chemist,* Weston Research Labs., 4 Lyons Road, Camperdown, N.S.W., Aust.

HAGLICH, ANTHONY M., The Great A & P Tea Co., 4248 W. 47th St., Chicago 32, Ill.

HOWARD, KENNETH L., *Manager, Technical Service,* Wallerstein Company, Mariners Harbor, Staten Island 2, N. Y.

HOWELL, D. D., Hunter Mlg. Co., Wellington, Kans.

JENNINGS, O. W., *Chemist* (Doty Laboratories), 4320 E. 53rd North, Kansas City 19, Mo.

JOHNSON, ALVIA P., Borden Foods Co., 3033 Glenfield, Dallas 24, Texas

KISAKI, HIROMU, *Professor,* Dept. of Domestic Science, Doshisha Women's College of Liberal Arts, Kyoto, Japan

KOEDDING, DONALD W., *Chemical Lab. Technician,* Continental Baking Co., Halstead Ave., Rye, N. Y.

LAURITZEN, GEORGE F., *President,* Lauritzen & Co., 7331 W. Agatite, Chicago 31, Ill.

MACMILLAN, DAVID B., *Control Chemist,* Robin Hood Flour Mills Ltd., P.O. Box 99, Calgary, Alberta.

MORTON, HOWARD, *Director,* Utilization Research Programs, Great Plains Wheat, Inc., Route 2, Longmont, Colo.

PAPPAS, CLIFFORD J. (Student, Kansas State University), J-31 Jardine Terrace, Manhattan, Kans.

RUEMPOLHAMER, FRANS H., (Gladiola Biscuit Co.), 139 Harvester St., Dallas 7, Texas

SARTOR, THOMAS E., JR. (Fisher Flouring Mills), 3401 37th Ave. S.W., Seattle 6, Wash.

TALLEY, MOLLY JANICE, *Research Chemist,* The Frito Co., 3420 Singleton Blvd., Dallas 12, Texas

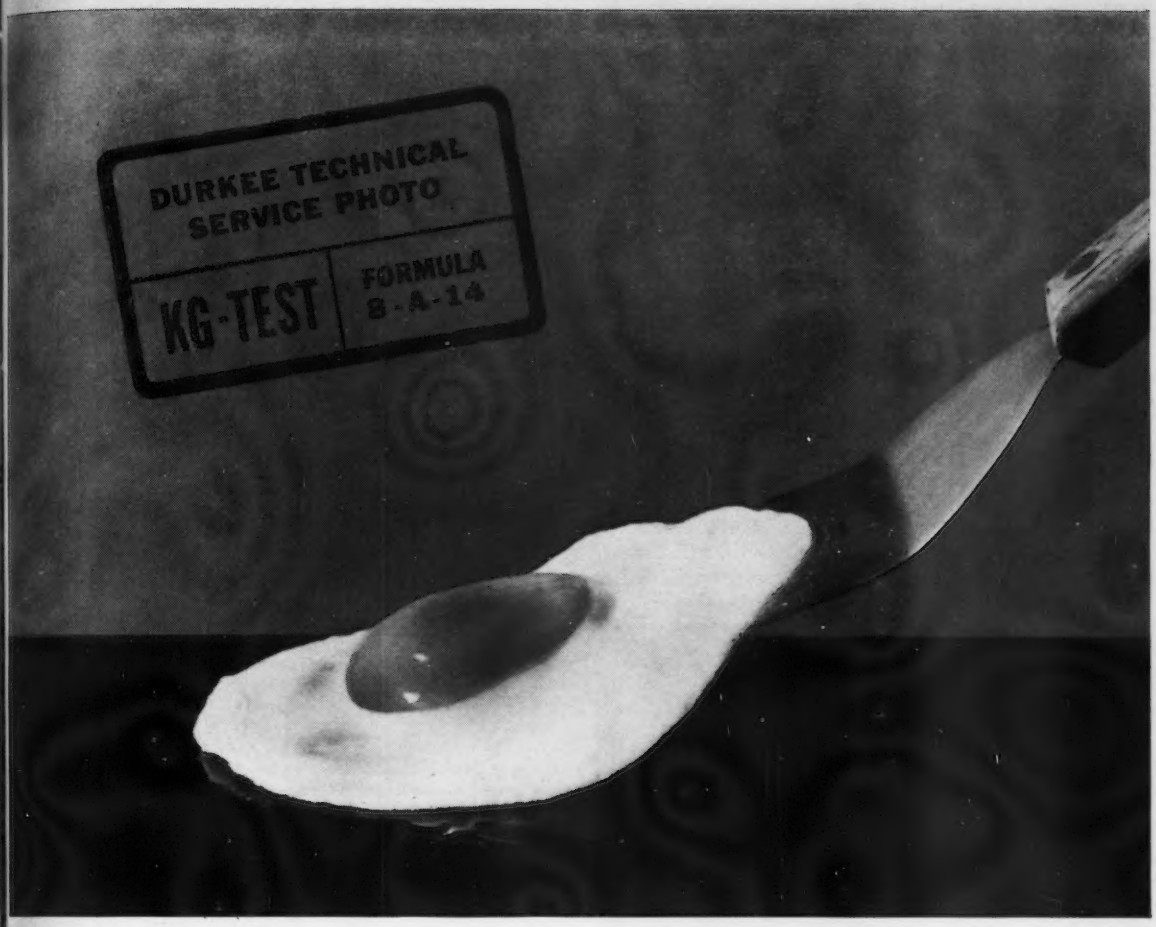
VOCK, FRED, Verona Aromatics, 26 Verona Ave., Newark 4, N. J.

WEBB, BILL D., *Chemist,* USDA, Rt. 5, Box 366, Beaumont, Texas

WINTER, WILLIAM G., *Chief Chemist,* Unilever Australia Pty. Ltd., Dry Creek, South Australia

WISDOM, L. W., *Research Chemist,* The Frito Co., 4520 Singleton Blvd., Dallas 12, Texas

WOLFF, STEPHEN J., Hoffman-LaRoche, Inc., Nutley 10, N. J.



STICK-PROOF FRYING *Kaola Gold Style*

How Durkee Took the Sticking, Spattering and High Cost Out of Frying

THE PROBLEM: *Sticky.* Since food was first fried, chefs have had to contend with fats and oils which caused foods to adhere to hot frying surfaces, that sputtered and spattered, and that cost a pretty penny to use. Durkee's Technical Staff determined to make an inexpensive frying medium which would minimize burning out under constant high grill temperatures, would not cause sticking or spattering, yet would have an appealing taste and appearance.

THE SOLUTION: *Slick.* Through painstaking development work, Durkee Research produced a completely different vegetable shortening (it's patented) which possesses the desired melting point, keeping quality and proper flavor. Equally important, the formula includes no milk solids, or salt, or water. Kaola Gold Vegetable Shortening, Durkee's new golden-colored frying shortening, cannot cause sticking or spattering and never needs refrigeration. Best of all, it costs considerably less than the more expensive frying mediums some chefs formerly used.

THE SIGNIFICANCE: *Plain.* Kaola Gold Vegetable Shortening, the first mass-produced specialized medium for pan and grill frying, is another example of Durkee know-how and research facilities helping make better products more economically. We'd welcome an opportunity to provide comparable assistance to you whenever your product or process warrants further attention. Just drop a line to

DURKEE TECHNICAL SERVICE

Department CST • 900 Union Commerce Building • Cleveland 14, Ohio
Jamaica, N. Y. • Louisville, Ky. • Berkeley, Calif. • Chicago, Ill.

Glidden QUALITY PRODUCTS

A SMALL WATER-JACKETED BOWL FOR THE AMYLOGRAPH[1]

The amylograph[2] is an excellent instrument for studying the characteristics of gelatinization under various conditions. However, it requires relatively large quantities of material and was found to be of limited use in a research laboratory where samples are necessarily prepared in small quantity. In order to make the amylograph do the job that was necessary in a research laboratory, it was fitted with a small bowl of 70-ml. capacity. The adaptation was made quite simply, retaining the mechanical features and dimensions of the original amylograph, by building a small bowl (Fig. 1,*A*) into the original bowl, *B*, and using

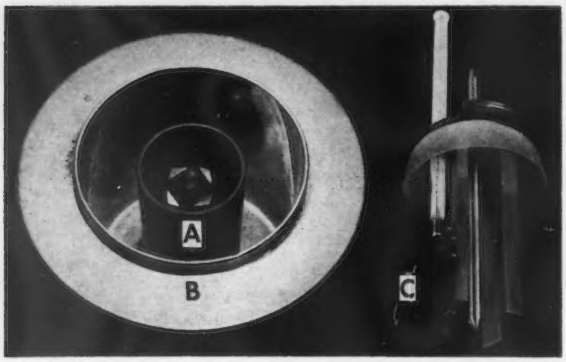


Fig. 1. The small bowl as built within the original amylograph bowl and the "feeler" fork. A, small bowl with tops of pins showing; B, original amylograph bowl — water-bath; C, feeler fork assembly showing thermometer, feeler pins, support pin, and plastic cover.

the outer bowl as a water-bath. A small "feeler" fork, *C*, and a change in the resistance (coil spring or balance) between the feeler fork and the recorder were necessary to make the adaptation complete.

The water-jacketed bowl and feeler fork are shown in working position in Fig. 2. The original thermoregulator, *A*, serves to regulate the water-bath, *F*, giving a controlled and uniform increase in temperature with time. The surface of the water in the bath is kept at the level of the projecting rim, *I*.

As shown in Fig. 1, the bowl and feeler fork each have four pins that were designed to give movement of the starch suspension away from the surface of the bowl (feeler pins Fig. 2, *C*) and away from the center supporting pin (Fig. 2, *E*, and bowl pins, *D*).[3] The design of the pins in the bowl is shown in Fig. 1. The feeler pins are similar but inverted so as to move the liquid in the opposite direction (away from the bowl surface). The minimum clearance between the bowl

[1] Published with the approval of the Director as Paper No. 1116, Journal Series, Nebraska Agricultural Experiment Station. Presented at the 46th annual meeting, Dallas, Texas, April 1961.

[2] C. W. Brabender Instruments, Inc., South Hackensack, N. J.

[3] In the newer amylograph models the supporting pin is absent; the feeler fork is supported from above.

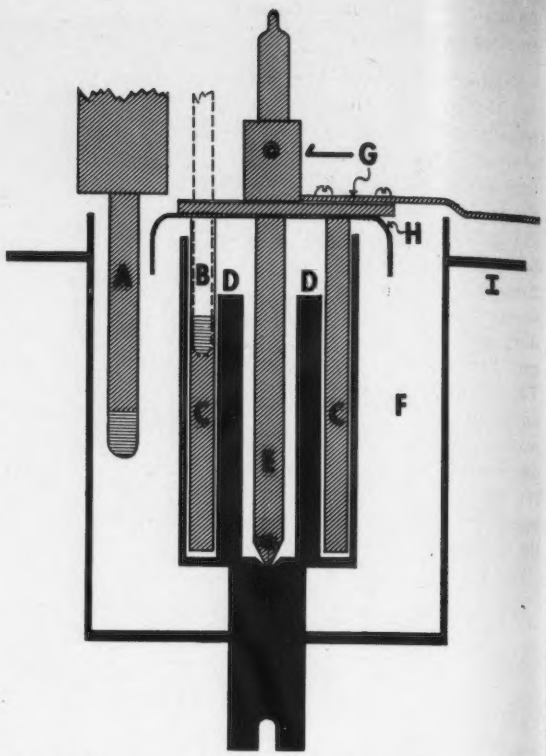


Fig. 2. The small-bowl water-bath assembly. A, thermoregulator; B, thermometer; C, feeler pins; D, bowl pins; E, supporting pin; F, water-bath; G, feeler fork; H. plastic cover; I, bowl rim.

surface and the feeler pins and between the feeler pins and the bowl pins is 1 mm.

The feeler fork carries a thermometer in a position between two pins where it does not interfere with the operation of the equipment, but is easily read (Fig. 2, *B*). The feeler fork also carries a plastic cover, *H*, the edge of which dips into the water in the water-bath. This effectively prevents evaporation from the starch suspension.

It was found necessary to raise the small bowl 1.5 cm. from the bottom of the water-bath in order to prevent premature gelatinization of the starch on the bottom, because of the rapid heat transfer through the metal bottom.

The small bowl has a working capacity of 70 ml. as compared with 500 for the original bowl. It has a diameter of 4 cm. and a depth of 8.5 cm. Under working conditions the temperature of the starch suspension lags about 2°C. behind that of the water-bath.

The small, water-jacketed bowl adapts the amylograph to use in a laboratory where research materials are frequently available in small quantities only. Heating through a water-bath also provides more uniform heating and eliminates the possible effects of high-intensity radiant heat applied intermittently to the bowl.

Acknowledgment

The authors are grateful to the Corn Industries Research Foundation for grants in support of this work.

R. M. SANDSTEDT AND R. C. ABBOTT

University of Nebraska
Lincoln, Nebraska

DILATOMETRY — RAPID METHOD FOR FINDING SAMPLE SIZE

Dilatometric techniques, when applied to edible fats and oils, are time-consuming determinations, requiring strict adherence to a fixed procedure. One of the tedious elements of these techniques is the determination of the weight of sample contained in a volumetric dilatometer. (A dilatometer of this type is shown in Fig. 1.) The sample size is usually determined by weighing the assembled dilatometer (containing 2 ml. of indicator solution, but without sample) to the nearest 0.01 g. on a torsion balance, filling it with deaerated fat, and then weighing again. The difference between these two values is the sample weight. This procedure must be repeated for every determination, since the tare weight can change for several reasons. Where many determinations are made each day, quite a bit of time is required to determine these two weights. In order to simplify the test and conserve time, the following rapid method for finding the size of sample was developed in our laboratory.

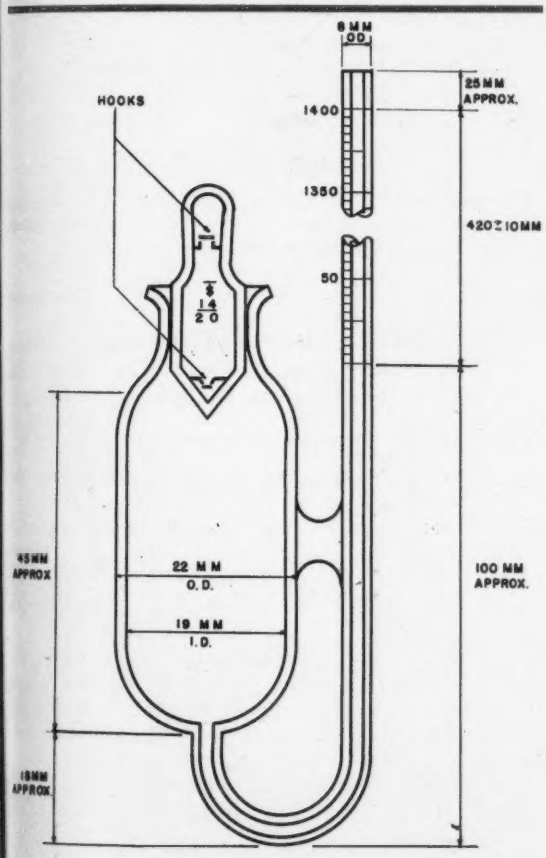


Fig. 1. Volumetric dilatometer.

Prepare the dilatometer, adding 2 ml. of deaerated indicator solution. Weigh the assembled dilatometer accurately to 0.001 g. on an analytical balance. Fill it with melted, deaerated fat and insert the stopper so that the indicator solution rises between the 1,000- and 1,200-unit marks. Wash the fat from the outside of the dilatometer with petroleum solvent. Air-dry and weigh the dilatometer again on the analytical balance to determine the actual weight of sample used.

Immerse the filled dilatometer in the 60°C. water bath to the 100-unit mark until the reading is constant, and read to the nearest 0.001 ml. Apply any corrections needed and plot the sample weight against the 60°C. reading on ordinary graph paper. Repeat this procedure using a smaller sample, so that the 60°C. reading is at least 100 units less than the first reading. Draw a straight line through the two points and extend it to both sides of the graph. The sample weight for normal fats can be read directly from the graph using the 60°C. reading.

One line, thus established, will be satisfactory for all predominantly C_{16} and C_{18} fats such as cottonseed, soybean, lard, and tallow. Typical weight curves for two dilatometers are shown in Fig. 2.

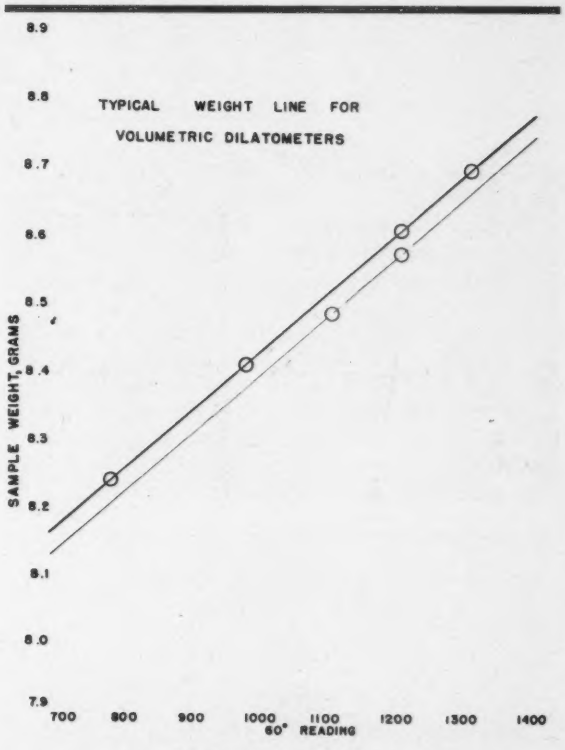


Fig. 2. Typical weight curves.

In the original work done on this method, five points were determined for each graph, giving a straight-line curve in every case. Comparison of these graphs with one another showed that the slopes of all the curves were identical for all the dilatometers. As a result, it was found that the determination of two points was sufficient to establish the line for any one dilatometer. This procedure has been used very successfully for many years. It saves a considerable amount of time each day by eliminating the necessity for weighing and reweighing the dilatometers. This also increases the accuracy of our work because balance errors are eliminated.

R. L. DOWDLE

HumKo Products
Memphis, Tenn.

Observations

Life seems to be crammed full of constant change. We get quite excited about the low protein content of the new-crop flour and immediately "push the panic button," since it looks like a genuine problem as to furnishing the American baker with the type of flour he wants. However, we push too soon. As sampling of the new crop continues we find that, although the protein is lower than average, yet the quality of the low-protein wheats is excellent: As a result, the baker can get along very well with less protein in his flour. Furthermore, the winter wheat raised in South Dakota and Montana proved not only of excellent quality but also excellent in quantity, which will help the American miller to get the protein level of his flour high enough to satisfy the baker. When the drouth hit the spring wheat area, we again were ready to push the panic button, because of such low yields of wheat in bushels. But, as this crop was harvested, we found that although the yield was small it was larger than anticipated, and furthermore we found that the bushels harvested were of excellent quality from the breadmaking point of view. It had plenty of protein and excellent quality.

Almost before we could complete the crop survey we were again ready to push the panic button when it was announced that the sedimentation test would be used in evaluating wheat for government storage in 1962. From all observations that the writer has been able to make, it appears quite certain that the sedimentation test is here to stay. For that reason, it appears very important that all cereal chemists get busy in setting up the sedimentation test so as to be thoroughly familiar with it when it is used in the wheat testing program in 1962.

We feel rather fortunate that we have been in and out of the sedimentation test for the past seventeen years, and therefore feel very well acquainted with the techniques involved in running this determination. We found long ago that the method of grinding samples of wheat for the sedimentation test is of the greatest importance in order to obtain interlaboratory checks within reason. We are also fully aware of the necessity for extreme care in all of the details of the test. On the other hand, when all such details are strictly adhered to it is quite possible for a laboratory to check its own results rather closely. We have not had sufficient time yet to determine how well we can check with various other laboratories and it is this area that we think needs some concentrated study between now and harvest time 1962.

It is so easy for all of us to push the panic button whenever a change of any kind comes along. However, we must remember that it is the mark of a true scientist to be able to adjust to change and take disappointments in stride. Let us never forget that as scientists we must always strive for perfection in laboratory techniques and leave policy decisions up to the managment department. Too often we try to formulate management policies in the laboratory instead of tending to our own particular area of study. Certainly when management asks our opinion, then it is time that we give our opinions and stand firm in backing our opinions with scientific facts.

It is beautiful fall fishing weather in the Missouri Ozarks. Why don't some of you drop me a line and join me in a fishing expedition? In this manner we can forget the "panic button" for a few contented hours of relaxation.

Yours truly,

Jim Doty

Doty Laboratories Inc.
1435 Clay St., P. O. Box 7474
Kansas City 16, Mo.

PREVIEWS from CEREAL CHEMISTRY

Table of Contents from Vol. 38, No. 6, November

The Determination of the Nitrogen Content of Cereal Grain by Colorimetric Methods. A. C. Jennings, Dept. of Agr. Chemistry, Waite Agr. Research Institute, Univ. of Adelaide, South Australia

Chloroethanol as a Cereal Protein Dispersant. N. W. Tschoegl, Bread Research Inst. of Australia, North Sydney

Diffusion Coefficients of Water in Wheat Kernels. Liang-tseng Fan, Do Sup Chung, and John A. Shellenberger, Dept. of Flour & Feed Milling Ind., Kansas State Univ., Manhattan

Effect of Some Volatile Chemicals on the Microbial Spoilage of Moist Kafir Corn (Andropogon sorghum) under Airtight Storage. K. S. Srinavasan and S. K. Majumder, Central Food Technological Research Institute, Mysore, India

Effect of Parboiling on the Thiamine, Riboflavin, and Niacin Contents of Wheat. Z. I. Sabry and R. I. Tannous, American University of Beirut, Beirut, Lebanon

Chloride Content of Cake Flours and Flour Fractions. William F. Sollars, Western Wheat Quality Laboratory, Crops Research Div., Agr. Research Service, USDA, Pullman, Wash.

The Biuret Test as Applied to the Estimation of Wheat Protein. Alvin J. Pinckney, Crops Research Div., Agr. Research Service, USDA, Beltsville, Md.

A Method for the Determination of Relative Amounts of Malted Wheat, Fungal (Aspergillus oryzae), and Bacterial (Bacillus subtilis) Alpha-Amylase in Mixtures and Its Application to Malted Wheat. James R. Fleming, Dept. Flour & Feed Milling Ind., Kansas State Univ., Manhattan; Byron S. Miller, General Mills, Inc., Minneapolis, Minn.; and John A. Johnson, Dept. Flour & Feed Milling Ind., KSU, Manhattan, Kansas

Identification of Carbonyl Compounds Produced in Pre-Ferments. Byron S. Miller, General Millls, Inc., Minneapolis, Minn.; John A. Johnson and Robert J. Robinson, Dept. of Flour & Feed Milling Ind., Kansas State Univ., Manhattan

o, But He Knows What He Likes! This stalwart minion of the law never tasted quail's tongues. But he's an authority on the more ubstantial "groceries". If he doesn't savor the flavor the first time, there'll be no second time. Felton Flavors supply the taste he likes. Like all Americans, he's adventurous in his tastes. The same old flavors weary him. He seeks new taste sensations. For 38 years, Felton has been giving old foods new taste and inspiring the creation of new foods. If you want to revitalize an existing product, or dream up a new one, send for the man from Felton—taste-makers of the nation. Felton Chemical Co., Inc., 599 Johnson Ave., Brooklyn 37, New York.

Felton

RECIPE FOR PREMIUM RESULTS IN PREMIUM PRODUCTS: USE

GLUCONO-DELTA-LACTONE

IN CHEMICAL LEAVENING

for: RAISIN BREAD

INGREDIENTS	% FLOUR BASIS
Flour, bread	100.0
Shortening	5.0
Salt	1.0
Dextrose*	5.5
Nonfat milk solids	6.0
Raisins, unbleached	30.0
Egg yolk solids	2.5
GDL	4.24 (may vary)
Sodium bicarbonate	2.0 (may vary)
Water	55.0 (varies according to flour absorption)

*A combination of dextrose and sucrose may be used.

Cream the shortening; add all dry ingredients and blend. Add cold water and mix one minute at low speed and then approximately 5 to 7 minutes 2nd speed. Sheet the dough, brush with fat; then spread with sugar and cinnamon (to taste) and mold into desired shape. Pan. Proof 5 minutes (optional). Bake 350°F. until done.

for: PIZZA SHELL MIX

INGREDIENTS	% FLOUR BASIS
Flour, bread	100.0
Nonfat milk solids	6.0
Sucrose	2.0
Dextrose	2.0
Salt	1.0
GDL	4.24 (may vary)
Sodium bicarbonate	2.0 (may vary)

To each 6 ounces of mix, add ½ cup (120 cc) of warm water (90° to 100°F.) and mix thoroughly with a fork. Shape dough into a smooth ball. Allow to stand approximately one minute. Divide dough into two equal parts. Place each piece in center of a greased 9-inch pie pan. (If desired, the undivided dough will make one 12-inch pie.) Grease fingers and press out the dough until it covers the pan. Cover with sauce and cheese and bake at 425°F. until well browned (approximately 20 minutes).

for: DANISH PASTRY

INGREDIENTS	% FLOUR BASIS
Sugar	9.0
Dextrose	9.0
Margarine	12.5
Salt	0.8
Whole eggs	18.8
Whole milk	53.0
Vanilla	To taste
Flour, hard wheat	100.0
GDL	4.24
Sodium bicarbonate	2.0
Margarine	62.0

Cream margarine with sugar, dextrose and salt. Add eggs gradually and mix at low speed. Add whole milk and vanilla and mix at low speed. Add a blend of flour, GDL and sodium bicarbonate gradually and mix at low speed. Roll out the dough. Dot margarine onto dough. Roll in and fold. Make up into desired shapes and bake at 350°F. until done.

For successful specialty baked goods in which chemical leavening can be used, add Pfizer GDL to your formula. GDL-leavened products have fine, even texture, show excellent volume and are free from unpleasant aftertaste — characteristics that can mean increased sales for you.

In dry mixes, GDL is stable during normal shelf life. In doughs or batters, GDL reserves its acidic activity and acts mainly during the baking cycle, the ideal chemical-leavening reaction time.

Typical recipes are given as a guide. Investigate the uses for GDL in your specialty items.

Chas. Pfizer & Co., Inc., Chemical Sales Division, New York 17, N. Y..

Please send me: __G D L Technical Data
__Suggested G D L Formulations
__Free Sample of G D L

Science for the world's well-being
Pfizer
CHEMICAL SALES DIVISION

Name_____

Title_____

Company_____

Address_____

City_____ State_____